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ABSTRACT

The development of thinking is accepted as the most comprehensive aim of American education. A prominent means of stimulating pupils' thinking in the classroom is the effective use of questions. To design a good question, the teacher should begin by analyzing the type of thinking to be fostered and settle on the type of task to initiate such thinking. The phrasing of good quesitons has been neglected in research and practice. A major aim of the social studies incorporates the development of pupils' thinking. This study investigates the influence of question types on the stimulation of critical thinking and social studies achievement. The concern is centered on teachers' classroom questions, and employing questions to develop children's thought processes. Teaching is not just asking questions, but rather stimulating pupils to ask effective questions. Social studies should guide children's thinking in a consideration of the rapidly changing present. Appropriate questions can expedite the achievement of having children analyze and evaluate their world. The five chapters of this study outline the objectives of the research problem, touch on related literature, detail the procedures utilized in the study, and present findings and conclusions. This research presents the question as a significant variable in the teaching-learning process. This study is a beginning; additional research is needed on the relationship of questions and questioning in particular to the educational situation in general. (ON)

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THE INFLUENCE OF ANALYSIS AND EVALUATION QUESTIONS ON ACHIEVEMENT AND CRITICAL THINKING IN SIXTH GRADE SOCIAL STUDIES

FRANCIS PETER HUNKINS

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CHAPTER I

INTRODUCTION

Problem

The development of thinking is accepted as the most comprehensive aim of American education (Chausow, 1965; Educational Policies Commission, 1961; National Educational Association, 1963; Starr, 1963). However valuable general aims may be, empirical research and teacher effort are requisite to provide direction from slogan to action in the educational enterprise (Komisar, 1961). Whether objectives are stated or unstated, a prominent means of stimulating pupils' thinking in the classroom is the effective use of questions. Questions used by teachers in their discourse and those incorporated in instructional materials probably are significant in guiding the development of the cognitive powers of pupils. "What were the reasons for that revolution?" "Why did the people react in that manner?" Questions reveal the operational objectives which stress, for example, the increase of pupils' skills at interpreting information and ideas.

The classroom teacher devotes a large portion of his time asking questions (e.g., Adams, 1964; Aschner, 1961; Barr, 1928; Floyd, 1960; Stevens, 1912). Aschner observed that teachers, by their use of questions, commonly "trigger" four types of thinking activities: remembering, reasoning, evaluating or judging, and creative thinking. In designing a good question, the teacher should, according to Aschner, begin by analyzing the type of thinking to be fostered and the type of task which must be set to initiate such thinking. The question must be clearly and precisely worded for it to possess the capacity to focus the thinking activity of pupils.

Although classroom questions may foster varied cognitive processes, the emphasis of most classroom questions seems concentrated on knowledge of facts, not on the use of knowledge in thinking (Adams, 1964; Floyd, 1960; Stevens, 1912). Pupils' classroom questions, moreover, relate pupils' perception of the teachers' emphasis on knowledge (Gatto, 1928). Probably rarely would a teacher carefully contemplate the wording and emphasis of a question; the question usually has a spontaneous birth in the atmosphere of classroom discourse. This absence of question-planning should not exist however in the preparation of textbooks and related instructional materials. Yet, the questions in these materials do predominately emphasize knowledge of facts (Davis and Hunkins, 1966).

The usefulness of questions has long been recognized as significant in the teaching-learning interaction. The phrasing of questions capable of stimulating higher thinking activity is difficult and has been among the most neglected dimensions of teaching in both research and practice. Developing effective questions presently plagues many good teachers. The dynamics of the classroom demand that teachers frame appropriate types of questions with speed and ease while in class discourse (Burton, 1944). The difficulty in the formation of effective questions had contributed, undoubtedly, to the dearth of research on questions and their uses.

Schooling is, or should be, organized in order that both ideas may develop and thinking may be stimulated. Acquisition of knowledge[1] is indispensable in this process, but it must be accompanied by thinking so that pupils are capable of utilizing their knowledge as the substance of thought. To implement the general goal of fostering thinking, "realizable" teaching strategies and specially prepared materials must be utilized with pupils. In these strategies and materials, surely, questions must be integral elements. Simply to continue to discuss the objective of thinking in vague terms is not only meaningless, it is nonproductive.

A major aim of the social studies incorporates the development of pupils' thinking. It thus appears feasible that the social studies, because of its basic accepted aims and its history, is an appropriate curricular area in which varying types of questions may be used to achieve this particular goal. However, attention to specific types of questions within the social studies, as well as in other areas of the curriculum, and their results on pupils' behavior, has been scant. This investigation was designed to provide some substantive evidence on the effect of three types of questions on critical thinking and achievement in sixth grade social studies. Presently, research evidence is unavailable regarding the influence of particular types of questions on pupils' thinking and achievement. Nevertheless, such information is vital if schools are to accomplish the aim of promoting pupils' thinking.

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[1] The term knowledge as used in this paper refers to the category as defined by Benjamin Bloom's Taxonomy of Educational Objectives. In this source, knowledge has three major categories: (1) knowledge of specifics, (2) knowledge of ways and means of dealing with specifics, and (3) knowledge of universals and abstractions in a field.

This research was specifically concerned with the relative effectiveness of three types of questions (emphasizing knowledge, analysis, and evaluation) based on three of the six hierarchical categories of Benjamin Bloom's _Taxonomy_ _of_ _Educational_ _Objectives_ (1956).[2] Knowledge questions require the recall of ideas, facts, materials, or phenomena. They call for the releasing of certain information stored in the individual's memory. Analysis questions, on the other hand, demand the arrangement and rearrangement of information into elements, relationships, and organizations. The third type of question, evaluation, requires a judgment employing criteria such as accuracy, effectiveness, economic quality, or satisfying quality. These two latter _Taxonomy_ categories subsume knowledge.

This _Taxonomy_, which appeared over a decade ago, is asserted to be useful in guiding the construction of questions capable of stimulating various cognitive processes (Bloom, 1956). Critical thinking, in terms of this study, incorporates the intellectual skills of (1) identifying central issues, (2) recognizing underlying assumptions, (3) evaluating evidence or authority, and (4) drawing warranted conclusions (e.g., Chausow, 1965; Dressel and Mayhew, 1954; Lewenstein, 1963; Taba, 1964).

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[2] Hereinafter, this volume will be referred to as "Bloom's _Taxonomy_" or the Taxonomy. Not only is the title long, but workers in the field commonly refer to it by these shortened versions.

Objectives

This study sought to determine whether a dominant use in social studies text-type materials of analysis and evaluation questions, as defined by Bloom's Taxonomy, would effectively stimulate the development of sixth grade pupils' critical thinking and social studies achievement. The overall hypothesis tested, stated in null form, was:

Use of text-type materials employing questions requiring "analysis" and "evaluation" will not result in differences in sixth grade pupils' critical thinking and social studies achievement when compared with the use of text-type materials incorporating questions requiring the recall of knowledge in relationship to pupils' (a) reading level, (b) sex, and (c) the interaction between these variables.

General Plan of Study

The general plan of the study first involved constructing two sets of text-type materials and corresponding answer sheets, one stressing questions requiring analysis and evaluation (Condition A) and the other containing questions stressing knowledge (Condition B). Pupils in both treatment conditions were directed to read designated sections of their textbook and to respond to the questions on their worksheets. For four weeks, pupils used these materials during a thirty-five minute portion of the daily social studies period. For this study, the instructional unit dealt with Africa and Oceania and was based on chapters in the adopted social studies text-book used by the cooperating school system. The general format and directions of the two sets of special materials were identical, the only varying factor being the questions and their emphases. During the experimental period, teachers refrained from actively engaging in teaching but assisted in coordinating the pupils' use of the materials. This lack of active teacher participation was an attempt to reduce their influence on the experimental situation.

Related Research and Pertinent Literature

This study investigated the influence of question types on the stimulation of critical thinking and social studies achievement. Reviewed in this section are major studies in four related areas of research; questions and questioning; questions in text-type materials; critical thinking in the social studies; and questions as they relate to the teaching act. In addition, this review incorporates a discussion of the research on the structure and use of Bloom's Taxonomy.

Questions and Questioning

Over fifty years ago, Stevens (1912) noted a dominant emphasis on memory questions in both English and social studies classes with a larger proportion of this type of question existing in the social studies sections. From Steven's study, which can be considered the first serious study of classroom questions, several conclusions were drawn: (a) the teacher did most of the work, questioning, in the class; the art of pupil's expression was smothered under the sheer number of teacher's questions, and individual differences of pupils received slight attention; (b) the classroom was considered primarily as a place for displaying knowledge instead of a laboratory for gaining understanding in depth, and slight effort appeared to be exerted to guide pupils in becoming self-reliant and independent workers.

Stevens' work provided the empirical evidence that teachers' questions were not geared to the development of higher cognitive functions of pupils. As a result, she requested an intelligent use of questions as instructional devices and stated that questions should stimulate reflective thought in addition to memorization of facts.

A contribution to the development of a strategy of question usage was Yamada's study (1913). He compared the effectiveness of telling or questioning about pictures with that of telling or questioning about objects or events from real life. Yamada concluded that the asking-questions session provided far greater range in providing information. However, the narrative or telling activities seemed to supply quality of thoughts. Yamada also exhibited concern with the position of questions in classroom discussion. He stated that it was better to have a narrative session, free spontaneous report first, and then to engage in questioning activity.

Even though the importance of questions was substantiated by Stevens and Yamada, questions received scant research attention for a number of years. The next serious attempt to study the question was by Gatto (1929) who wished to discover the nature of pupils' questions in relation to various pupil characteristics and to utilize this information in the improvement of classroom procedures and study processes. This study possesses relevance to teachers' questions for the questions of pupils tend to reveal their perceptions of teachers' questions and questioning techniques. Also, pupils' questions often act as indices of the quality of questions present in textbooks and other instructional materials.

Gatto's investigation revealed that memorization was the most common study activity stimulated by classroom questions. The overwhelming emphasis on memory activities was present in all curricular subjects, grade levels, and ages considered. Pupil's questions also reflected those types of questions present in textbooks. This undue emphasis on memory activity can be interpreted as an indictment of the questioning environment constructed and the materials used by the teacher.

Haynes (1935) examined sixth grade teachers' classroom questions in relation to teacher characteristics, including intelligence and experience. Questions were analyzed with reference to (1) total number asked, (2) number of factual questions asked, (3) number of questions demanding thought, (4) number of alternate questions (only two answers), (5) number of leading questions, and (6) the number of current questions dealing with topics of the day. Among his conclusions, Haynes noted a significant correlation between the intelligence of teachers and the number of thought questions asked. Conclusions also revealed that teachers with high intelligence asked more alternate and leading questions. Teachers tended to ask fewer questions as their experience increased. However, no relationship existed between experience and the type of questions asked by teachers, but school atmosphere was related to questioning techniques.

Over the years, questioning, an important feature of the teaching act and of instructional materials, has not been singled out for the attention it deserves, either in research or in speculation. Recently, however, interest has revived concerning questions in the instructional context. The concern seems to be centered on (1) teachers' classroom questions, and (2) employing questions to develop children's thought processes.

For example, Floyd (1960) studied the oral questioning activity of selected primary school teachers. His purpose was to reveal the current and prevalent oral questioning techniques of the "best" primary teachers and their classes in Colorado elementary schools. Analysis of taped discourse of thirty classrooms evidenced that about 70 per cent of the oral expressions were delivered by the teacher and that 93 per cent of all questions were teacher-originated. Concerning quality of questions, Floyd observed that questions capable of stimulating thinking were employed only slightly more than 5 per cent of the time. Forty-two per cent of the questions asked were memory questions. Teachers' oral questions seemed to be used primarily to check the recall of facts, not to stimulate thinking. Additionally depressing was his finding that pupils in the investigation generally did not receive opportunities to question and that little time was provided either before or after teacher-talk for pupils to raise questions or obtain additional information.

Adams (1964), using a system of categories by which he classified the questions asked by secondary school English and social studies teachers, discovered a dominating emphasis on memory questions. However, his analysis revealed that memory questions were used by present-day teachers (both social studies and English) to a lesser degree than was true of teachers in Stevens' (1912) earlier study.

In this recent growth of interest in questions, Suchman's (1958) technique of inquiry training has commanded considerable attention. However, this procedure does not specify the exact types of questions pupils ask, or should ask. In fact, Suchman sheds little light upon the effectiveness of types of questions in his inquiry training procedure. However, others have dealt, in some degree, with this crucial problem of form and type of question in inquiry training. For instance, Blank (1963), studying inquiry training within the medium of programmed instruction, required sixth graders to ask questions about the relevant dimensions of problems prior to attempts at solution. Analysis of data indicated that children in the inquiry training program, when contrasted with children not in the program, asked significantly more questions on both oral and written criterion tests and participated more in class discussion with no detriment to class progress.

On the other hand, Herrick (1962) concluded from his research that the use of problem-setting questions prior to solution produced no significant increases in either rate or amount of learning. The conflicting results of Blank's and Herrick's studies preclude generalizations at this time. Tangentially related to these findings are those of Vuke (1962) who studied the placement of questions in filmed materials. Vuke found that students who viewed a version of a film containing inserted questions did not learn significantly more than students who viewed the film lacking inserted questions. The foregoing research results reveal that even though questions have been considered by research and in educational literature, little serious attention has been given to the cognitive processes which different types of questions might stimulate.

However, the situation has somewhat changed in that recent attention has been directed to the cognitive emphases of student teachers' and pupils' questions (Clegg, 1967; Davis and Tinsley, 1967). Davis and Tinsley developed a rating scale, Teacher-Pupil

Question Inventory (TPQI), to measure the range of cognitive objectives manifested by the questions of 44 student teachers in secondary school social studies. This inventory had nine categories, the first seven adapted from Bloom's Taxonomy: memory, interpretation, translation, application, analysis, synthesis, evaluation, affectivity, and procedure. Observers trained in the use of the TPQI spent two periods recording the cognitive emphases of the questions asked by student teachers and pupils. The schedule consisted of 30 minutes of observation divided into alternating 5 minute segments. Inspection of the inventory list revealed that memory was the dominant question emphasis employed by both teachers and pupils. Interpretation and translation, levels of comprehension, comprised the next largest number of questions asked.

Clegg's study attempted to do at the elementary level what Davis and Tinsley had done at the secondary level. A modified form of the TPQI was utilized to record the level of cognitive behavior of six student teachers. Critic teachers, trained in the use of the inventory observed the student teachers. Clegg's modified TPQI had only six categories, each representative of a level in Bloom's hierarchy. Clegg followed the same procedure for gathering data as did Davis and Tinsley. From results obtained, Clegg concluded that there existed a complete range of cognitive levels in the questions asked by the student teachers. Also, only twenty-seven per cent of the questions asked were classified as memory questions. Further analyses indicated that significant differences existed between the level of questions of the six student teachers. These results indicate that additional research is requisite to ascertain exactly the cognitive emphases of teachers' and pupils' questions.

While educational research dealing specifically with questions is scant, numerous articles, speeches, and books have praised the merits of the question as a device for effective teaching. The tenor of the general position is illustrated by the writings of several individuals. De Garmo (1911), for example, asserted that excellent questioning was excellent teaching. "In the skillful use of the question more than in anything else lies the fine art of teaching: for in (such use) we have the guide to clear and vivid ideas, the quick spur to imagination, the stimulus to thought, the incentive to action" (p. 179). De Garmo grouped questions by type as a guide for teachers. If a question were good, then it should stimulate the cognitive activity of the pupil and should assist him in extending his knowledge and increasing his power of expression. Other early advocates of the effective use of questions in the classroom were Hall and Hall (1916). They criticized the public of the time for using the term "teaching" too loosely--using it to include almost everything the teacher did. To them, teaching was the stimulation of thinking and was achieved, they believed, by the employment of thought-provoking questions.

Cole (1933) attempted to provide the teacher with insight into the "how" of good questions and questioning. According to him, the greatest skill in questioning was manifested not so much by the teacher asking effective questions, but rather, by the teacher stimulating the pupils to formulate pertinent questions concerning the subject. Cole's rationale exhibits a similarity to that underlying the recent emphasis on inquiry training, having the pupils question, search, evaluate, question again.

General principles of method basic to good questioning and suggestions to draw teacher-questioning away from the specific-fact emphasis were identified by Burton (1929). He made clear that questions could be grouped into two general classes: thought questions, designed to stimulate pupils' reflective processes, and drill questions, emphasizing isolated facts or arbitrary associations. The thought question, he asserted, demands of the teacher patience to let the pupils think. Thought questions need situations which force pupils not to accept information, but to question, to analyze, to think about information. Later, Burton (1944) stated that if questioning was to be improved, the teacher's knowledge of aims had to undergo improvement. Teachers had to consider the mental processes of learning to adapt the questioning technique to these processes. Recently, Burton, in collaboration with Kimball and Wing (1960) elaborated the previously stated values of the question and questioning procedures with particular attention to the development of critical thinking.

Loughlin (1961), like De Garmo, stated that effective questioning is effective teaching. His list of principles for questioning included (1) distribute questions so that the entire class is involved, (2) have a balance between factual and thought-provoking questions,

(3) utilize both simple and exacting questions, (4) encourage responses of some length, and (5) stimulate critical thinking by asking "To what extent? How? Why? Compare?" Klebaner (1964) supported these general principles by asserting that the purpose of the question must be identified by the teacher and realized by the pupil. Pupils should be made aware, he insisted, of the types of answers which different kinds of questions demand. This recommendation is consistent with Yamada's (1913) point that the nature of the answer is somewhat dependent upon the form of the question.

Klebaner's statement that the question's purpose must be known by both teacher and pupil suggests training in formulating questions. Recently Bradley (1966) asserted that teachers direct little attention to structuring questions. He contended that if good questioning is to comprise the teaching-learning environment, two problems require solution. The first relates to the failure of most pupils to ask significant questions about subjects they are studying. The second problem, related to the first, refers to the absence of formal instruction in how to ask effective questions.

Teachers, if they realize a need for training pupils in structuring questions, most likely will attempt to provide such training. Pupils will strive to improve their questions if they see the role of questions in relation to their studies. Toler (1967) poses the question "What do we want children to learn through questioning?" He points out that questions provide vehicles for stimulating the intellectual experiences of pupils. Questions provide guidance in clarifying concepts and in stimulating various thought processes. Toler further asserts that pupils learn the value of other pupils' questions in relation to the importance attributed their own. The teacher must reveal to his pupils a genuine interest in the questions they develop.

Wellington and Wellington (1962) also advocated more effective use of questions in the teaching situation. Teaching, they stressed, was not the teacher asking questions, but rather the teacher guiding pupils so that they asked effective questions. Carner (1963) took somewhat the same position in stressing that teachers must be cognizant of the types of thinking required before they can frame effective questions. He concluded that teachers need to be aware of the level (concrete, abstract) of questions that is most appropriate to a particular learning situation. He discussed several cognitive skills which should be nurtured by questions, those of sensing continuity and sequence, perceiving relationships, making inferences, drawing sound conclusions, and evaluating the validity of information. He also stressed that pupils needed opportunities to develop the ability to independently formulate questions about materials with which they dealt.

More recently Broughton (1966) asserted that the efficiency of teachers largely depends upon the close interaction between teacher and learner. A prime means of maintaining this interaction is effective questioning. He stressed that teachers need to develop their skill of questioning.

Summary

The past half century has provided little empirical research on questions and questioning. Research efforts have been directed toward the determination of the types of questions used by teachers and, in some instances, to what types of questions teachers stimulate their pupils to formulate. However, the accumulated research evidence is meager. The research which has been conducted indicates that most teachers' questions are low on the cognitive-emphasis scale. No research to date has sought to determine the influence of varying types of questions on pupils' learning.

That questions which teachers ask are not geared to stimulating thinking cannot be attributed to the lack of exhortation found in the educational literature. The characteristics of good questions have been described in numerous papers. Good teaching, according to some writers, has been equated with good questioning. To many, fostering pupils' ability to question has been considered a prime function of the teacher.

The research related to teachers' questions, and illustrative speculative, and representative exhortative papers about questions and questioning techniques have been discussed in this section. This previous attention to questions, although useful, nevertheless fails to provide the insight necessary for improving questioning, for, in most instances, the information and suggestions are based upon philosophical and pedagogical assumptions rather than on the results of empirically derived evidence.

Questions in Text-Type Materials

Few investigations have focused on the use of questions in instructional materials. Washburne (1929) and Golden (1943), for example, studied the effects of placement of questions in materials, only to have their efforts produce contradictory results. Washburne wished to discover whether questions should be presented at the end, beginning, or scattered throughout a textbook chapter for the most effective stimulation of learning. He concluded that poorly placed questions were worse than no questions at all and that the poorest placement existed at the end of the chapter, while the best placement was at the beginning of the chapter. Golden's fifth and sixth grade pupils had their reading guided by questions prior or following reading. The differences between the two groups in reading achievement after the investigation were slight, but continually favored those pupils who experienced questions after the material. Golden concluded, with reservation, that optimal placement of questions was at the end of the material.

In 1951, attention was given to the development of a strategy of using questions (Johnson). This strategy also related to the placement of questions in relation to reading material. However, Johnson wished to investigate the value of formulating a pattern of questions rather than just the placement of questions before or after material. Johnson designed "pre-questions" which conveyed a pattern that embraced the facts and arguments of a passage. These pre-questions were supportive of a theme or central question. Three groups of subjects comprised the experimental population. The first group experienced questions prepared so as to stress the "central question" or theme of the passage. The second group reacted to questions presented before the passage, but they were not supportive of a theme. The third group did not receive any questions prior to the reading of the material. From examination of his data, Johnson concluded that the immediate recall of the two groups receiving the questions prior to reading was not statistically different. The organization of a question around a theme did not seem to make any difference in the ability to answer recall or inference questions on a test. However, both groups consistently excelled the group not provided questions prior to reading the passages. These data support somewhat Washburne's (1929) investigations. After a two-week period, results revealed that students who received the central theme questions achieved better with regard to comprehension as well as factural recall.

Recent research by Rothkopf (1967) supports Golden's conclusion. Rothkopf involved 252 high school students in reading a thirty-six page passage with two questions aloted to every three pages. The questions were located either before or after the relevant material. Results indicated that retention was highest among those students experiencing questions after the relevant segments of material. Rothkopf, cautioning readers not to interpret the data as decisive, explained the results by stating that a kind of adaptative evolution of learning behaviors takes place when questions are placed after the material. The individual in confronting the questions sees where he has been successful in reading the material and thus maintains and strengthens his method of interacting with the material. Those students finding themselves unsuccessful also could adjust their reading techniques.

The nature of the textbook question has received frequent attention. Cunningham (1925), after categorizing questions in seven textbooks and three workbooks in general science into twenty-two categories, discovered question emphasis centered on recall and memorization. Curtis (1943), utilizing categories similar to Cunningham's, analyzed the questions found in textbooks and workbooks of physics, chemistry, biology, and general science. His conclusions corroborated Cunningham's. Davis and Hunkins (1966), studying the questions in three elementary school social studies textbooks and using Bloom's Taxonomy as a criterion, observed an overwhelming emphasis on knowledge of specific facts. The textbook emphasis (history, geography, or fused) did not alter the overbalance of questions demanding specifically factual information. Pfeiffer and Davis (1965), using the same criterion, revealed a similar overall emphasis in questions on teacher-made (ninth-grade) tests for three different junior high school programs. Eaton (1964) investigated the use of questions in elementary school astronomy materials from the standpoint of quantity in text material with respect to their effectiveness in stimulating science achievement and favorable attitudes toward science. The number of questions in textual material was compared with the number of activities and incongruities also present in the material. Eaton concluded that activities produced the highest achievement scores for the majority of pupils. He expressed doubt that questions in text narrative can be considered an optimal means for stimulating intellectual skills, achievement, and attitudes.

Interest regarding the textbook question still commands attention. Hearn (1967), employing Bloom's Taxonomy as criteria, investigated the cognitive emphases of questions in the narratives and captions of four sixth-grade textbooks. Results revealed that the largest number of questions dealing with the text narrative demanded only knowledge of facts. However, Hearn pointed out that a range of cognitive emphases was present. The cognitive levels of questions in captions was somewhat higher than those in the narrative. Over seventy-five percent of these questions emphasized comprehension.

Smoot (1967) examined questions in four world history textbooks. He also utilized the hierarchical levels of Bloom's Taxonomy as criteria to determine cognitive level of questions. His investigation revealed that these texts contained a dominance of knowledge questions, seventy-nine per cent for end-of-chapter questions. Questions at the end of units had a somewhat lower knowledge emphasis, only fifty per cent of the questions being in this area. Comprehension represented the next greatest category of questions, fourteen per cent at ends of chapters and twenty-six per cent at ends of units. Gregory

(1968) analyzed three civics and problems of democracy textbooks and found that results varied in different books. In two books, knowledge questions comprised the majority. However, the third book contained only three per cent knowledge questions with thirty-five per cent analysis questions and thirty-three per cent evaluation questions. Synthesis questions totaled sixteen per cent. This last text was designed as a problems-approach book. An important aspect of this study was that all levels of the Taxonomy were represented in all three books. Even the book containing over seventy-five per cent knowledge questions had seven per cent of its questions dealing with evaluation.

Summary

This section on questions in text-type materials reveals a paucity of empirical research. A superficial generalization is that placement of questions might have some influence upon learning. However, confidence may be placed in the general findings that question emphases are primarily concerned with factual material to the neglect of the development of cognition. Probably the most important implication of this review is the obvious necessity of additional research on this general problem.

Critical Thinking in the Social Studies

A task fundamental to the social studies is assisting pupils in determining whether there is any warrant for holding certain beliefs (Metcalf, 1962). Social studies strives to have pupils examine and understand society. According to Hullfish (1961), thinking is developing a plan and a capability to believe. Believing signifies a willingness to act. In acting, one examines information and questions alternatives.

To develop the ability and inclination of students to think independently ranks as a major purpose of the school. Questions can and should be utilized to stimulate thinking, critical thinking in particular. The social studies long has been considered an appropriate curricular area in which to foster this type of thinking. Starr (1963) enumerated the possibilities for this type of thinking in the social studies: (1) applying critical thinking to the historical accuracy of events, (2) employing this thinking in geography in relation to national stereotypes and disparities in living standards, (3) applying this thinking in economics to the relationships existing among big business, big labor, big government, and (4) in the social studies area in general, applying this thinking to controversial issues. Darrow (1964) stressed that the social studies should reorient children's thinking. That is, social studies should guide children's thinking in a consideration of the rapidly changing present. Past events should make the present more comprehensible. Questions can expedite the achievement of this goal by having children analyze and evaluate their world.

A great variety of changes has been advocated for the social studies. Robinson (1963) stressed that the social studies and the school in general need to be concerned not so much with preparing children to effectively adapt to the pressures of modern society, but rather to adapt to the leisures of modern society. The revolution which Robinson encourages for the social studies is not a violent one, but rather a gradual and continuous one. Massialas (1963) advocated change within the social studies utilizing inquiry models which stress thinking. Social situations need to be considered as hypotheses many times rather than as facts. Massialas advocated the introduction of norms--value components brought into the curriculum to foster thinking.

General agreement exists among social scientists and educators that the ability to think about social, political, and economic issues, clearly, critically, and with regard to the most appropriate information constitutes a desirable educational objective. Indeed, if social studies is to consider the social nature and problems of man, it cannot exclude critical thinking. If hypotheses are to be introduced into the classroom, then critical thinking must take place. But what is critical thinking? Dressel and Mayhew (1954) claimed that it is a process of analyzing a problem, examining its logical and factual bases, and arriving at warranted conclusions. Russell (1956) offered a similar definition, considering critical thinking as the process of examining both the concrete and abstract in relation to objective evidence, comparing the objective or statement with some norm or standard, and arriving at some conclusions in connection with the judgment made. More recently, Russell (1960) termed critical thinking as the process of evaluation or categorization consistent with some previously selected and accepted standards. He also pointed out that "in a world where the child gets little help in evaluating the ideas in the comic strip, the movie 'epic,' the advertising 'pitch,' and the unspoken assumptions of the TV western, it seems important that school programs give help in developing critical thinking abilities" (P. 652).

If pupils are to engage in developing critical thinking abilities they must first be cognizant of the aspects of this thinking process (Ennis, 1962). Pupils must have grasped the meaning of statements, must be able to recognize ambiguity in reasoning, must recognize contradiction in statements, and must recognize acceptable authority. Finally, pupils must judge whether a conclusion follows necessarily from the available facts. Swift (1959) believed explanation to be an aspect of critical thinking. Explanation was defined as an accounting for, a process of establishing some relationships between conditions or statements of affairs. Boraas (1922) presumed critical thinking to be criticism, the "act or art of judging by some standard." His comments were concerned with the entire curriculum but are applicable to the social studies.

Numerous studies and reviews of studies and articles have considered critical thinking within the context of the social studies. The aim of this attention has been to eliminate, change, alter, shift, the "usual" social studies content so that it indeed will stimulate critical thinking. For example, Rothstein (1960), involving two groups of eleventh grade students, hypothesized that a concentrated strategy on thinking within the framework of American history would stimulate an increase in critical thinking with no loss in subject matter achievement. For 36 weeks, students were given the training and opportunity for thinking about their history content. After the experimental period, Rothstein's results revealed that such emphasis had indeed facilitated the development of the thinking abilities of the group receiving the emphasis on thinking. McGarry (1961) detected that greater gains in reflective thinking resulted from the analysis of basic social concepts than from the mastery of sets of data. Cox (1963) took a somewhat different approach to stimulating critical thinking in utilizing a critical thinking model consisting of (1) orientation, (2) hypothesis formulation, (3) definition of terms, (4) exploration, (5) evidencing, and (6) generalization. Method A involved the use of "springboards" of open-ended discussions leading to the conceptualization of hypotheses. Method B involved basicly fact recall. Cox's findings revealed no significant differences in tested critical thinking between the methods employed. These results, however, were not supported by the analysis of tape recordings which evidenced that the group in Method A possessed greater facility in reproducing the critical thinking model.

Elemere (1963) found that a problem-solving approach to teaching United States History produced significantly greater pupil achievement and increased skill in problem solving over a traditional teaching approach. Cousin's (1963) study revealed that reflectively-oriented instruction fostered both the acquisition of facts and skills of reflective thinking to a greater extent than traditionally-oriented instruction. Hunkins and Shapiro (1963) demonstrated a gain in critical thinking of fifth graders by employing a case method technique in social studies instruction.

The concern for using the social studies to foster growth in thinking is not recent. Helseth (1926) investigated for an entire year the activities of elementary school pupils' study of history. The study strove to encourage pupils' questioning of historical phenomena and information. She concluded that pupils could develop skill in thinking more effectively when studying United States history in an atmosphere where they were encouraged to ask questions and to answer their own questions.

The development of thinking individuals within the total curricular framework, and specifically within the social studies framework, has been the object of much research. However, questioning, a significant feature of the teaching technique in many of these studies, has not been examined specifically and has been confounded with other instructional variables. This result has meant that few, if any, meaningful generalizations can be made with assurance about the effects of particular types of questions on pupils' thinking abilities.

Summary

To remove critical thinking from the realm of slogan, various definitions and aspects of definitions were discussed. All seemed to stress several common elements including analysis and the use of norms. After defining terms, some significant studies and reports were reviewed. All studies aimed to increase critical thinking without contributing to a loss in the acquisition of knowledge. Research reviewed in this section has been based on quite general procedures, some of which have used questions as elements, but without understanding their effects. The potential contribution of different types of questions to the development of critical thinking remains unrealized.

The Teaching Act

Some recent studies of the teaching act (e.g., Aschner, 1959; Aschner and Gallagher, 1961; Bellack, 1963; Siddle and Ellena, 1964; Flanders, 1962; Hughes, 1959; Kean, 1965; B. O. Smith, 1962) have considered questions and questioning as elements of the total classroom discourse, but this research, designed for other purposes, provides limited insight on question types and their effects. Aschner (1959), for example, studied logical aspects of teaching. She found that the manner in which teachers addressed questions, the ways questions are worded, occasions upon which they are asked, and the frequency of asking them, are accompanied by correspondingly different kinds of pupils' behaviors. If teachers' control of questions is possible, then it also would be possible to test the kinds of thinking that follow upon questions. Aschner asserted that the teacher's role as questioner should be that of a strategist rather than that of an inquisiter.

Up to 1964, only Taba had proposed specific teaching strategies employing questions to develop thinking. The central objective of her study was to facilitate the augmentation of thought under three optimum training conditions: (1) a curriculum designed for thought development; (2) teaching strategies focused explicitly on the mastery of cognitive skills; and (3) sufficient time span to permit a developmental sequence in this process of development.

Taba denoted that questions can serve as a focus which circumscribes the mental operations which pupils can perform, limits the points possible to explore, and influences the types of thinking they can develop. A questioning strategy should provide, she urged, an appropriate constraint within a structured freedom. Questions, Taba affirmed, can be utilized as transition devices from one level of thought to another. They also can stimulate the formation of new conceptual schemes. Taba stated that a strategy of questions should stimulate and guide the direction of a knowledge, instead of providing a particular model or the end product of the search. Questions, she suggested, should do more than stimulate the regurgitation of information. Taba concluded that the discrimination of data is a skill which is prerequisite to performing the more sophisticated operations of inference making. Strategies utilizing questions emphasizing specific facts first and then proceeding to higher-level questions seemed to produce an effective and persistent raising of thought to higher levels. Her conclusions were offered, essentially, as hypotheses for future research.

Some attention has been directed to questions and questioning in the investigations concerning microteaching at Stanford (Allen, 1967). Using this technique, Allen and others are attempting to educate students in effective teaching, but, it must be borne in mind that microteaching is aimed at the total teaching act, not at providing detailed empirical data on the realm of questions.

Los Angeles County Schools (1966) has provided an instructional bulletin aimed at assisting teachers to improve their questioning. This bulletin, designed for workshop use, utilizes the hierarchical levels of Bloom's Taxonomy. Questions are introduced in a sequential order of difficulty. Anticipated pupil responses are provided to enable teachers to grasp insights into questioning.

Summary

This section has indicated that much research has neglected specific treatment of the question as a part of the teaching act. A promising note is that of Taba's work and her consideration of questions as part of teaching strategies.

The Taxonomy of Educational Objectives: Cognitive Domain

In all of the research concerned with questions, thinking, and teaching, researchers usually have devised unique criterion measures. Somewhat surprising is that the *Taxonomy of Educational Objectives: Cognitive Domain* (Bloom, 1956) (See Appendix C) in existence for over a decade, has so seldom been employed as a guide for teachers' questions and as a means for their study. The *Taxonomy* was intended to provide a classification of educational goals. Its usefulness, consequently, seems not limited to teachers; it is also of general use to administrators, curriculum workers, supervisors, and researchers. The Taxonomy, a tool which facilitates translation of theoretical formulations into practical applications, has two major divisions: knowledge and intellectual abilities and skills. These two major categories are incorporated into six hierarchically-arranged categories: knowledge, comprehension, application, analysis, synthesis, and evaluation. The last five categories, intellectual abilities and skills, are seen as those cognitive activities which allow an individual to utilize appropriate information and techniques in an effective interaction with his environment.

Although Jarolimek (1962) suggested several uses of the *Taxonomy*, primarily as a guide for differentiated instruction, and Lessinger (1963) urged its use as a tool to provide creative test construction utilizing test banks, and Torbett (1963) recommended its use as a model for unit development in the social studies, only a few studies have used the Taxonomy as a research tool. Sanders (1965, 1966) employed the Taxonomy as a guide to question formation for classroom work and tests. He discussed suggestions for planning and composing questions and guidelines for the utilization of questions in the classroom. Davis and Hunkins (1966) applied the Taxonomy as a criterion measure in the analysis of fifth grade social studies textbook questions. Each question was categorized, according to its dominant emphasis, into one of the six categories present in Bloom. Eighty-seven per cent of the questions analyzed stressed knowledge, the remaining thirteen per cent being divided among the five intellectual abilities and skills. These results mirror the emphases found in classroom teaching (Adams, 1964; Floyd, 1960). Also utilizing the Taxonomy as a criterion, Pfeiffer and Davis (1965) classified examination questions used in ninth grade courses in order to ascertain the cognitive challenges for students in junior high school courses: prevocational, business, and college preparatory. The overall emphasis of all three courses concentrated on the lower cognitive levels as presented in the Taxonomy.

Lombard (1966) proposed the utilization of the Taxonomy in developing test questions which would reflect the cognitive emphasis of the stated objectives. Utilizing the Taxonomy as a guide in determining stated or implied objectives was the concern of Ellis (1963) and Elliott (1965). Ellis wished to discover whether or not a logical scheme could be generated which would identify different levels of thinking in relation to specific health content. He proposed to utilize the Taxonomy in the identification of the cognitive emphasis built into the objectives. Conclusions obtained from the study gave evidence that the Taxonomy could be applied to the field of health education in defining substantive content and objectives. Elliott investigated the feasibility of a procedure for enabling educators to utilize the Taxonomy to evaluate the lesson plan objectives of student teachers. He found that judges could not independently categorize lesson plan objectives in relationship to the Taxonomy's categories.

Klein (1965) considered whether a particular definition of cognitive behaviors as stated in the Taxonomy could be elicited and detected in children aged seven through nine. She constructed an objective test, basing the item emphases on the Taxonomy's categories, as the instrument to test her major hypothesis. Many of the Bloom categories, she concluded, were sufficiently discrete to be of educational assistance in teaching and that measurement of such development of these cognitive behaviors was possible by a paper-and-pencil test. Skinner (1966) also utilized the Taxonomy as a guide in test construction. However, his test only considered the categories of knowledge, comprehension, application, and analysis.

The Taxonomy is beginning to receive attention aimed at investigating its internal, hierarchical structure. Stoker and

Kropp (1964) found general support of a hierarchical structure of the Taxonomy with a possible misplacement of the evaluation category. This team has recently suggested additional studies of the nature of the Taxonomy (Kropp, Stoker, Bashaw, 1966). Richard Smith (1965) determined that the knowledge and comprehension subclasses of the Taxonomy did not confirm a simplex-to-complex continuum, but only suggested an increase in the mean level of difficulty as a subject progresses from the knowledge level through comprehension. Smith and Peterson's study (1965) examined the same two categories but did not add confirmation for a simplex-to-complex continuum.

These last two studies are not sufficient to disprove the assumption that a hierarchy does exist. The assumption, however, must be accepted with the awareness of this limited research. Too, these studies have not been concerned with the categories of analysis and evaluation. These two categories seem to bear direct relationship to critical thinking. The time seems propitious to investigate the impact of specific kinds of questions on the development of pupils' thinking.

Summary

The Taxonomy has been neglected until recent years. Some of the present interest is in the use of this tool as a guide for instructional purposes, unit construction, and test construction. Employment of the Taxonomy in both generating better questions and analyzing the nature of questions in materials and tests represents a modest research beginning. Although evidence is not conclusive, the cognitive behaviors of pupils have been measured by instruments inspired and guided by the _Taxonomy_. Most recently, the _Taxonomy's_ own structure has received belated attention.

Summary

This chapter has discussed the problem for research, stated the objectives of the study, and reviewed related literature and research. The general plan of the study also was included.

Chapter II details the procedures utilized in this study. The findings and conclusions of the study are presented in Chapter III. Chapter IV relates the findings of the study to the educational situation in general, and to questions and questioning in particular.

CHAPTER II

PROCEDURE

This chapter details the procedures of the investigation. Information regarding the subjects, the experimental materials developed, and the administration of the experiment are described, and limitations of the study are discussed.

Subjects

Two hundred and sixty pupils served as subjects in this study. They were enrolled in eleven sixth grade classes in three elementary schools serving the same geographic area of a large suburban public school system in a northeastern Ohio community (population, 47,922, 1960 census). This city was adjacent to a middle-sized industrial city (population 290,351, 1960 census). The eleven classes were randomly assigned to one of two experimental treatment conditions, A or B. A total of 127 pupils (67 boys and 60 girls) was assigned to Condition A, while ~~128~~ 133 pupils (55 boys and ~~73~~ 78 girls) were assigned to Condition B. Twenty-eight pupils had been eliminated from the study because of lack of complete data.

TABLE 1.--SUMMARY OF INTELLIGENCE QUOTIENTS AND READING ACHIEVEMENT TEST SCORES OF PUPILS IN TREATMENT A AND B BY SEX

Sex of pupils	Intelligence quotient*						Reading achievement**					
	Treatment A			Treatment B			Treatment A			Treatment B		
	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
Male	67	114.84	16.06	55	112.07	15.38	67	38.90	12.18	55	36.45	10.39
Female	60	115.80	15.10	78	113.11	12.65	60	41.86	11.45	78	39.29	9.74
Total	127			133			127			133		

*Intelligence quotients obtained from *California Test of Mental Maturity*, S Form.

**Test scores obtained from the *Stanford Achievement Test*, Form W.

Background data were collected and analyzed for both pupils and teachers. Intelligence quotients and reading achievement test scores are summarized in Table 1.

Pupil's IQ scores and reading scores were subjected to analysis of variance to determine if significant differences were present. For this analysis, scores were considered across reading levels by treatment and sex. The results of the analysis of variance of the IQ and reading data are summarized in Table 2 and Table 3.

TABLE 2.--SUMMARY OF ANALYSIS OF VARIANCE FOR IQ DATA

Source of Variation	d.f.	S.S.	M.S.	F
Treatment	1	7.45	7.45	2.25
Sex	1	1.00	1.00	.30
Treatment x sex	1	1.15	1.15	.34
Within groups	256	847.36	3.31	

TABLE 3.--SUMMARY OF ANALYSIS OF VARIANCE FOR READING ACHIEVEMENT DATA

Source of Variation	d.f.	S.S.	M.S.	F
Treatment	1	6.30	6.30	3.46
Sex	1	8.41	8.41	4.62*
Treatment x sex	1	.01	.01	.005
Within groups	256	465.92	1.82	

*Significant at the .05 level.

No significant differences in IQ were revealed between the two treatments, between boys and girls, or their interaction. Thus IQ was eliminated as a possible covariant on subsequent analyses of the criterion data. No significant difference between reading achievement was noted between the two treatments and no interaction either. A significant difference between the reading scores of boys and girls was observed. However, this relationship was not considered sufficient reason to use the reading scores as covariants on subsequent analyses of criterion data. Had significant differences in reading achievement existed between treatments, such scores would have been employed as covariants.

Background data on the participating teachers are presented in Table 4 and reveal that teachers of classes in both Conditions were similar with respect to age and teaching experience. Seven of the teachers were in the age range 20-29 years, two teachers were in the age range 40-49 years, one teacher was in the age range 50-59 years, and another teacher was in the 60-69 year age range. The experience of the teachers ranged from one year to twenty-four years with three teachers being in their first year of teaching.

Arrangements for the Study

A preliminary meeting was held in October, 1965, with the superintendent, school psychologist, and the elementary coordinator to discuss the basic purpose of the investigation. The study was outlined and tentative arrangements for the investigation were

TABLE 4.--BACKGROUND DATA ON PARTICIPATING TEACHERS

Data categories	Treatment A	Treatment B	Total
Mean age	35.16	33.20	34.27
Mean years of teaching experience	8.33	8.80	8.54
Mean years teaching social studies	8.16	8.80	8.45
Mean years teaching sixth grade	5.66	3.80	4.81
Number having degrees			
(Bachelors)	5	5	10
(Masters)		1	1
No degree	1*		1*
Majors (Elem. Educ.)	6	4	10
(English)		1**	1**
Number of teachers native to Ohio	6	3	9

* This teacher had 24 years teaching experience.

** The teacher with the English major at the Bachelor's level had a masters degree in education.

completed. The school officials agreed to furnish the investigator with IQ and reading achievement data on pupils from the schools' cumulative records.

In December, the principals whose schools were to be involved were advised as to the specific objective of the investigation and presented an abstract of the study. All teachers were to be informed that the investigation was concerned with evaluating a new type of classroom instructional material. In this way, teachers would not know that the materials used in their classes were different and, thus, would not unconsciously bias the results. A tentative unit, Africa and Oceania, was selected, and a time schedule for the study was determined. Several other meetings were held involving both teachers and principals before the investigation commenced. Teachers were assured that this was not a study to investigate their teaching abilities but, rather, to test some new instructional materials.

A four week period for the conduct of the study was agreed upon by the teachers and principals and February 1 was set as the starting date. The unit on Africa and Oceania, covering chapters 18, 19, and 20 in the system's adopted social studies textbook, The Changing Old World (Cooper, Sorensen, and Todd, 1961), was accepted by the teachers as the instructional content of the unit.

Teachers also agreed to administer the criterion tests both before and immediately following the study period. A uniform procedure of material introduction was decided upon. Teachers agreed to tell pupils that the materials were being tested to determine if they were effective in teaching social studies. This standardization of teachers' verbal introduction of materials was believed to reduce the variability of motivation among teachers to a similar level. Having the teachers administer all the tests was considered to provide for a more normal classroom situation, reduce confusion, and, hopefully, reduce the "Hawthorne effect" possibility attributable to a "special" person coming into the classroom.

At the final meeting of teachers prior to the experiment, the pre-achievement test, introductory set of materials, and the first week's materials (sets 1 and 2) were distributed. Information sheets were provided the teachers to reinforce their conception of the investigation. Teachers were again informed of the schedule of delivery and pick-up of materials. Each Friday during the experimental period, a new set of materials would be delivered to each class and the "used" set collected by the investigator.

Discussion of the introductory set of materials and answer sheets was to be allowed to eliminate pupils' doubts as to how to work with the materials. However, the teachers were told to stress upon their pupils that this would be the only time that discussion of the materials would be permitted. All eleven teachers agreed to answer pupils' questions (e.g., "Why are we doing these materials?") with an answer that these materials were an attempt to discover how well they assisted sixth grade pupils to learn social studies. This answer no doubt introduced the "Hawthorne effect" but, if so, it was probably distributed uniformly across all groups of pupils in both treatments.

Teachers were encouraged to study all materials in order that they might anticipate any difficulties that the pupils might have with the questions. Pupils were not to be allowed to take their textbook home, thus allowing them no preview of future reading. The only exception to this was in preparing to study for the final achievement test. Previews of experimental materials by pupils also were not to be allowed.

Collection of Data

Reading Achievement and Intelligence Quotients

Data on pupils' reading achievement were obtained, in raw score form, from the Stanford Achievement Test (Form W) which had been given in the spring of 1965 when the participating pupils were in the fifth grade. Intelligence quotients were secured from the California Test of Mental Maturity (Form S) administered to the pupils in October, 1965. Both sets of scores were procured from the schools' cumulative records because school officials did not want to interfere with their established testing programs, and also they did not want the pupils to be administered additional tests during the school year.

Test of Critical Thinking

The Social Studies Inference Test (I.T.), developed by

Hilda Taba (1964), was used as the criterion test of critical thinking (see Appendix E). This test was designed to assess pupils' ability to interpret what is presented in a situation and to formulate judgments regarding the validity of inferences from these data. The test does not yield a single "critical thinking" score but, rather, scores on four aspects of critical thinking: discrimination, inference, caution, and over-generalization. Taba defines discrimination as the mental process of distinguishing one event or object from another. Inference, according to her, is the ability to make inferences from data including the following logical operations: interpolating, extrapolating, predicting, hypothesizing, and explaining. The category of caution, she asserts, measures an individual's tendency to avoid taking a risk. Her final category, over-generalization, refers to an individual's mental behavior of using little empirical data in arriving at conclusions. The test presents the pupil with various stories describing situations in which certain behaviors or events are interrelated. Following the story, the pupil must decide whether a statement is "probably true," "probably false," or "cannot tell" from the information presented. Odd-even reliability coefficients (at $P<.01$) for this test at the sixth grade level were reported to be: inference, .87; discrimination, .88; caution, .85; and over-generalization, .71. The I.T. was administered as both a pre- and a post-test. The pre-test was administered January 18, two weeks prior to the initiation of the investigation, and the post-test was administered immediately at the investigation's termination.

Achievement Test

A criterion test of achievement covering the selected social studies unit was constructed by the investigator. The objective of the test design was to afford a single achievement score in addition to six sub-scores corresponding to the six categories in Bloom's *Taxonomy*; knowledge, comprehension, application, analysis, synthesis, and evaluation (see Appendix F). The investigation was concerned with the total achievement score as well as with the six sub-scores.

A total of 59 multiple-choice, four-option items was written and submitted to two judges well acquainted with the *Taxonomy*, one judge having used it in her doctoral study (Pfeiffer, 1966). These judges categorized each question according to its cognitive emphasis. Initial agreement on judged question emphasis was reached between the two judges and the investigator on 51 of the 59 questions or 89 per cent of the item pool. The remaining items had agreement between the investigator and one judge. After revision of those items failing to receive unanimous agreement on the initial judging, they again were categorized by the two judges. With four exceptions, only items having 100 per cent agreement were selected for the final test. Unanimous agreement was not possible on two intended application items and two intended synthesis items. From this pool of items, 42 were chosen to comprise the achievement test. The test contained seven questions in each of the six Bloom categories (see Appendix G). Reliability of the post-test was determined to be .68 using the Kuder-Richardson formula (Guilford, 1956). The final achievement test was subjected to a readability analysis employing the Dale-Chall formula (Dale and Chall, 1948). Results revealed a 5.16 raw score which was interpreted as indicating a reading level appropriate for the sixth grade. This achievement test was used as both a pre- and post-test.

Experimental Materials and Procedure

Pupils in both experimental treatmentsused the regularly adopted social studies text, The Changing Old World (Cooper, Sorensen, and Todd, 1951). The unit for study during the experiment was "Africa, Australia and New Zealand," involving Chapters 18, 19, and 20 of the textbook. Since this area of the world is not well known by most pupils, this selection was an attempt to limit the amount of prior knowledge which the individuals would bring to the investigation. This unit also was easily incorporated into the study because no teachers in the system had taught this material.

Experimental Pupil Materials

For each experimental treatment condition, special experimental materials and answer sheets were constructed (see Appendix D). The sets for both conditions were identical in format and directions. The only varying factor between the sets was the different question emphasis in each. Seventeen sets for each condition were developed to correspond to discrete portions of the adopted text. An introductory set, identical for both conditions, was written to acquaint the pupils

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with the general nature of the materials. The questions, within each of the seventeen sets, were presented in random order in relation to the organization of the textual narrative. Pupils were instructed to write answers to each question on spaces provided.

In the conceptualization of the experimental sets, approximately 40 to 50 per cent of the questions for Condition A would be categorized as requiring analysis and evaluation and 90 per cent of the questions for Condition B would be classified as requiring knowledge only. Materials for Condition A had, upon final analysis, 47.53 per cent of the total questions in the analysis and evaluation categories. This percentage was divided as follows: 28.41 per cent of the questions analysis, and 19.12 per cent of the questions evaluation. Condition B actually contained a question emphasis on knowledge of 87.38 per cent of the total number. These percentages of question types for both treatment conditions are presented in Table 5.

The first drafts of the materials for the pupils were examined by the same judges who served to classify the achievement test items. Every question of each set was categorized by the judges, and, following this, the two individuals met with the investigator to compare results. Each judge and the investigator discussed questions on which their judgments disagreed. Without knowledge of the textbook, a judge could interpret a question emphasis to be of one level, when another interpretation might be evidenced if the judge were cognizant of what the

TABLE 5.--PERCENTAGES OF QUESTION TYPES IN EXPERIMENTAL MATERIALS FOR TREATMENT A AND B

Question types	Treatment A	Treatment B
Knowledge	31.14	87.38
Comprehension	15.30	6.94
Application	3.27	.63
Analysis	28.41	3.15
Synthesis	2.73	.94
Evaluation	19.12	.94
Total	99.97*	99.98*

* Total percentages not 100 because of rounding error.

question referred to in the textual narrative. Questions had to be considered in relation to the text. Question form was not always enough to enable a judge to correctly interpret the cognitive direction of a question. If a question emphasis could not be agreed upon after discussion, the question was either rewritten until the desired emphasis was obtained or not employed in the final draft of the materials. Observation of Table 6 reveals that the Condition A materials had a much lower initial agreement than Condition B's. This situation was expected since questions demanding the higher

TABLE 6.--PERCENTAGE OF INITIAL AGREEMENT AMONG JUDGES AND INVESTIGATOR REGARDING QUESTION EMPHASES IN SET MATERIALS

Materials	Treatment A	Treatment B
Set I, 1	25.00	90.00
Set I, 2	30.00	72.00
Set II, 1	53.00	99.00
Set II, 2	66.00	73.00
Set II, 3	75.00	100.00
Set II, 4	75.00	100.00
Set II, 5	70.00	93.00
Set III, 1	44.00	100.00
Set III, 2	22.00	58.00
Set III, 3	75.00	90.00
Set III, 4	50.00	66.00
Set III, 5	76.00	86.00
Set IV, 1	60.00	55.00
Set IV, 2	33.00	94.00
Set IV, 3	40.00	83.00
Set IV, 4	45.00	86.00
Set IV, 5	72.00	86.00

cognitive functions were much more difficult to classify when isolated from the narrative to which they referred. The categories of comprehension, analysis and synthesis were the areas of most initial disagreement. The first two categories (knowledge and comprehension) were many times confused, since interpretation regarding these categories depended upon prior knowledge of the textbook passages (Hunkins, 1966).

To provide insight into the appropriateness of the questions to be employed in the experiment, 188 questions, randomly chosen from the materials, were presented for reaction to 26 sixth grade pupils at the University School, Kent State University. These pupils were similar in home background and academic ability to the subjects in the study. From these pupils' reaction sheets, 11 were randomly selected for analysis. Sixty-six per cent of the questions were categorized as "good" questions; 42 per cent as "good" questions and "clear"; 24 per cent as "good questions, made you think." Thirty-four per cent of the questions were judged "poor;" either "too hard" or "not clear." That 34 per cent of the questions were ranked as hard or not clear did not detract, in the investigator's opinion, from the questions. Questions demanding the higher cognitive functions would appear hard to most children. These pupils also were asked at what grade level these questions could best be used. Nine of the 11 pupils stated that the questions were "good" for the sixth grade; the other two pupils considered the seventh grade as a more appropriate level.

A readability analysis, employing the Dale-Chall formula, was used to determine the reading level of both the experimental materials and the answer sheets in both Conditions A and B. Results of this analysis revealed that the experimental materials had an average raw score of 5.64 designating a reading level well within the range of fifth and sixth grade pupils. Analysis of the answer sheets revealed an average raw score of 5.65, also designating the material as appropriate for sixth graders.

Working with the Materials

Pupils in both Conditions were instructed to work independently with the materials. They were given from 30 to 35 minutes each day to work with the experimental sets, reading carefully and writing their answers in the provided spaces. After completion of the worksheet, pupils were given an answer sheet with which they could evaluate their own work. Pupils were encouraged to write down the correct answers to questions they had missed in their social studies notebook.

Pupils who finished early were encouraged to work on class social studies projects or engage in independent reading. The remaining time in the social studies period, after the 35 minutes, was utilized by the teachers in activities appropriate to the unit of study such as pupil reports, construction of dioramas and bulletin boards, and independent reading.

Analysis of Data

The experimental design basic to this study was an analysis of covariance design. Within each treatment condition, data were analyzed according to sex and reading achievement. This resulted in a 2 x 2 x 4 (treatment x sex x reading level) classificatory scheme.

c	Sex							
	Male				Female			
b	Reading level				Reading level			
a	Q_1	Q_2	Q_3	Q_4	Q_1	Q_2	Q_3	Q_4
Treatment A								
Treatment B								

Pupils were assigned reading levels according to quartile ranks as determined by their raw scores on the reading achievement test (Stanford Achievement Test, Form W). The four levels had the following ranges: Quartile 1, 0-31; Quartile 2, 32-38; Quartile 3, 39-47; and Quartile 4, 48-64.

Limitations

Several possible limitations to this study must be advanced. Even though teachers did not actively intervene in pupils' use of these materials, they were present in the room and thus possibly affected the pupils in some unknown ways. The assumption of no interclass or intraclass differences may have had a confounding effect upon the results of the investigation. Generalization must be cautious, but may be extended to a hypothetical super-population having characteristics not significantly different from those of the study group which might be conceived as a sample of the larger population. The reliability of .68 for the achievement test is rather low, and the reader should bear this in mind when considering the results. This study is presented, with its limitations, in anticipation of opening an entire area of research.

Summary

This chapter presented the procedures of this investigation. In some detail, the subjects and teachers involved in the experiment were described. The experimental materials and the criterion tests were discussed in relation to their characteristics and the purposes they served in the study. Pupils' use of the materials was explained. The basic experimental design was considered. Limitations of the study were suggested. Chapter III reports the statistical analyses employed and the results of the investigation.

CHAPTER III

RESULTS

Results obtained in this study are presented in two parts: covariance analyses of pupils' critical thinking and pupils' achievement, and correlational analyses of pupils' critical thinking and pupils' achievement. The major hypothesis that the use of text-type materials employing questions requiring "analysis" and "evaluation" would not result in differences in sixth grade pupils' critical thinking and social studies achievement when compared to the use of text-type materials incorporating questions most of which required the recall of knowledge was tested by analysis of covariance.[1] The pre-test scores of the critical thinking test and the achievement test were utilized as covariants in the relevant analyses based on an approximation procedure (Tsao, 1946).

Analysis of Pupils' Critical Thinking

Since the criterion test of critical thinking, the Social Studies Inference Test, did not yield a total score, its four subscores (inference, caution, over-generalization, and discrimination) were analyzed separately. The means and standard deviations for the pre- and post-test scores for the four critical thinking sub-tests are summarized in Tables 7 through 10 (see Appendix A).

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[1] Bartlett's test of homogeneity was applied to all data, and the results obtained confirmed the assumption of homogeneous variance.

Results of the analysis of covariance of the post-test inference scores, adjusting for pre-test inference scores, are presented in Table 11 (see Appendix A). No significant differences were observed for any main effects and interactions. Consequently, with respect to inference, the dominant use (approximately 50 per cent) of analysis and evaluation questions did not produce significant differences between the two treatment groups. The adjusted means for the inference sub-test are presented in Table 12 and are displayed graphically in Figure 1 (see Appendix A).

The results of the analysis of covariance of the post-test caution scores adjusting for pre-test scores for caution are summarized in Table 13 (see Appendix A). The adjusted post-test means for caution are presented in Table 14 and graphically in Figure II.

As is evident from Table 13, two main effects and one interaction were statistically significant. Pupils in Condition A (analysis and evaluation questions) scored higher on caution than did pupils in Condition B(knowledge questions); too, girls scored higher on caution than did boys. The significant treatment x reading level interaction (see Table 15 and Figure III, Appendix A) helps explain the significant treatment effect. Pupils in Condition A at the Quartile 3 reading level scored significantly[2] higher than pupils in Condition A, Quartile 2 and Quartile 4 and in Condition B, Quartile 2, Quartile 3 and Quartile 4, but not higher than pupils in Conditions A and B reading level Quartile 1. Pupils in Condition B, Quartile 1 scored significantly higher than pupils in Condition B, Quartile 2, Quartile 3, and Quartile 4. The adjusted means were non-significant between the two conditions at reading levels Quartiles 1, 2, and 4.

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[2] Scheffe's Test employed to determine significance between various means. All Scheffe's Test results interpreted at the .05 level. Appendix B contains the Scheffe's Test data for the various means in table form.

The results of the analysis of covariance of the post-test over-generalization scores adjusting for pre-test scores for over-generalization are summarized in Table 16 (see Appendix A). Adjusted post-test means are presented in Table 17 and graphically displayed in Figure IV (see Appendix A).

No statistically significant differences were observed for any of the main effects, and only one interaction reached significance. Overall, then, questions emphasizing higher level cognitive processes did not result in pupils' higher or lower over-generalization than that exhibited by pupils using questions dominated by knowledge items. The treatment x reading level interaction (see Table 18 and Figure V, Appendix A), however, reveals that pupils reacted differentially in the two conditions at different reading levels. Specifically, pupils using the higher level questions (Condition A) at the lowest reading level, Quartile 1, over-generalized more than pupils using the knowledge questions (Condition B) at the Quartile 1 reading level as well as higher than pupils in Condition A, Quartile 3 and Quartile 4 and in Condition B, Quartile 4. Pupils in

Condition A, Quartile 2, over-generalized more than those in Condition A, Quartile 3 and Quartile 4 and Condition B, Quartile 1 and Quartile 4. Higher over-generalization was observed for pupils in Condition B, Quartile 2, than for those in Condition B, Quartile 1 and Quartile 4, and in Condition A, Quartile 3 and Quartile 4; also higher over-generalization scores were made by those in Condition B, Quartile 3, than pupils in Condition B, Quartile 1 and Quartile 4, and Condition A, Quartile 3 and Quartile 4. Pupils in Condition A, Quartile 1 and Quartile 2, and in Condition B, Quartile 2 and Quartile 3, over-generalized at non-significantly different levels. Similarly, pupils in Condition B, Quartile 1 and Quartile 4, and in Condition A, Quartile 3 and Quartile 4, did not differ significantly in their over-generalization and, as indicated above, had lower over-generalization scores than pupils in Condition A, Quartile 1 and Quartile 2, and in Condition B, Quartile 2 and Quartile 3. Consequently, these results indicate that the poorest readers (Quartile 1) who used the knowledge questions (Condition B), the better than average readers (Quartile 3) who used the higher level questions (Condition A), and the best readers (Quartile 4) in both conditions over-generalized less than pupils in the other treatment-reading level groups.

Results of the analysis of covariance of the post-test discrimination scores adjusted for pre-test discrimination scores are presented in Table 19 (see Appendix A). Table 20 presents the adjusted post-test discrimination means which are graphically displayed on Figure VI.

As may be observed, there were no statistically significant differences in discrimination between pupils in the two treatment conditions and between boys and girls and no significant interactions. Pupils reading level, however, was related to their discrimination scores (see Table 21). Discrimination scores of all pupils in reading levels Quartile 1 and Quartile 2 were not statistically different. Pupils in Quartile 4 scored higher on discrimination than those in Quartile 3, Quartile 2, and Quartile 1; pupils in Quartile 3 scored higher than both Quartile 2 and Quartile 1.

Analysis of Pupils' Social Studies Total Achievement Scores

Means and standard deviations of pupils' scores on the pre- and post-tests for achievement are presented in Table 22 (see Appendix A). The post-test achievement scores were subjected to analysis of covariance adjusting for the pre-achievement scores. The results are summarized in Table 23 (see Appendix A). The adjusted means of the post-test achievement scores are presented in Table 24 and graphically displayed in Figure VII.

No statistically significant difference in achievement between boys and girls was observed, and there were no significant interactions. Pupils in Condition A achieved more than did those in Condition B, and better readers made higher achievement scores than did poorer readers. The adjusted means for the post-achievement test for each reading level are presented in Table 25 (see Appendix A).

Observation of this table reveals, as one might expect, that pupils with higher reading abilities were able to achieve significantly better than pupils lacking such abilities. Pupils in Quartile 4 achieved significantly better than did pupils in Quartile 3, Quartile 2, and Quartile 1. Pupils reading at the third quartile achieved better than did pupils at Quartile 2, and Quartile 1. Pupils at Quartile 2 also achieved better than did pupils at Quartile 1.

Analysis of Pupils' Social Studies Achievement Sub-Scores

Data related to each sub-score on the social studies achievement test were subjected to analysis of covariance adjusting for the pre-achievement sub-scores. Each sub-test score represented a category of questions emphasizing a particular level of Bloom's Taxonomy. The test levels were knowledge, comprehension, application, analysis, synthesis, and evaluation. The test thus produced six groupings of data. The means and standard deviations of pupils' scores on the pre- and post-sub-test scores are presented in Tables 26 through 31 (see Appendix A).

The results of the covariance analysis on the knowledge sub-test scores adjusted for pre-test scores are presented in Table 32 (Appendix A). The adjusted means of the post-test knowledge sub-scores comprise Table 33 (Appendix A) and are graphically represented in Figure VIII.

No statistically significant difference in level of knowledge was observed between either treatment group or between boys and girls. The data further revealed no significant interactions. The level of knowledge attainment, however, was related to the reading ability of the subjects (see Table 34, Appendix A). Better readers attained higher scores in knowledge achievement. Pupils in Quartile 4 scored statistically higher on knowledge questions than pupils in Quartile 3, Quartile 2, and Quartile 1. Pupils in Quartile 3 scored significantly higher in knowledge than did those in Quartile 1. The difference between the knowledge scores of pupils at Quartile 3 and 2 proved non-significant.

Results of the analysis of covariance of post-test comprehension sub-test scores adjusted for pre-test comprehension sub-test scores constitute Table 35 (see Appendix A). Table 36 reports data on the adjusted means for the post-test comprehension sub-test scores. Figure IX depicts this data graphically.

Examination of Table 35 (see Appendix A) makes evident that pupils in Treatment A and B did not comprehend significantly better or worse than one another. Also no significant differences were observed between boys and girls regarding level of comprehension. Data failed to reveal any significant interactions.

As one might anticipate, the level of comprehension was significantly related to the reading levels of the subjects.

Table 37 (see Appendix A) reports this data. Pupils in Quartile 4 comprehended more than did pupils in Quartile 3, Quartile 2, and Quartile 1. Pupils reading at Quartile 3 failed to achieve greater comprehension than pupils at the two lower quartiles.

Table 38 (see Appendix A) delineates the results of the analysis of covariance of post-test scores relating to the application sub-test. The adjusted means for this data are presented in Table 39 (see Appendix A) and graphically portrayed in Figure X.

Observation of Table 38 (see Appendix A) reveals that sex exerted a significant influence in relation to application. Boys achieved significantly higher on the application questions than did girls. As in the previous two sub-tests, reading played a significant role with pupils in the higher reading quartiles receiving higher scores in application (see Table 40, Appendix A). The data revealed no significant interactions. The F for the treatment main effect approached significance, an F of 3.89 being required. Although not at the accepted significance level (.05), the high level questions did enable pupils in Treatment A to more effectively deal with the application questions.

With regard to the reading data, pupils in Quartile 4 attained higher scores in application than did pupils in Quartile 3, Quartile 2, and Quartile 1. Pupils at Quartile 3 achieved better in this category of the achievement test than did pupils at Quartile 2 and Quartile 1. Differences in application scores of pupils at Quartile 2 and 1 also were significant with pupils at Quartile 2 having the higher scores.

Table 41 (see Appendix A) represents the data for the analysis of covariance of the post-sub-test scores of analysis. Adjusted means for this data are presented in Table 42 and graphically represented in Figure XI.

As one can observe from Table 41, the results of analysis of covariance dealing with the analysis sub-test scores revealed that again reading exerted a significant influence upon the pupils' scores. No differences in analysis scores were reported between pupils in either treatment group or between boys and girls. No significant double interactions were observed. However, a significant triple interaction at the .05 level was evidenced. The significance of this interaction can be explained by looking at the F scores for the treatment and reading level main effects. The 3.75 reported for the treatment main effect almost achieved significance at the .05 level, 3.89 being required. Pupils in Treatment A did possess a slightly higher total score on analysis. The F value (2.50) for the treatment by reading level interaction also just missed being significant at the .05 level. Thus, it seems reasonable to attribute this significant triple interaction to an interaction between treatment and reading level with greater emphasis upon the factor of reading level. Better readers did achieve significantly higher analysis scores.

Data for the reading scores can be observed in Table 43 (see Appendix A). Application of the Scheffe's Test revealed that pupils in Quartile 4 achieved significantly better on analysis questions than did those pupils in Quartile 3, Quartile 2, and Quartile 1. Pupils at Quartile 3 achieved significantly better than did pupils at Quartile 2 and Quartile 1. Differences between means of pupils at Quartile 1 and 2 proved non-significant.

Observation of Table 44 (see Appendix A) dealing with the analysis of covariance for the synthesis sub-test data discloses a pattern rather familiar by now. The main effect of reading level yielded a significant F value. The other main effects failed to achieve significance. No double interactions were significant. However, the data evidenced a significant triple interaction. It seems quite safe in interpreting this interaction as being primarily influenced by the significant main effect of reading. Certainly, observation of the table confirms that sex did not constitute a factor of great influence upon the results. The reading level by sex interaction approached attainment of a significant F value, F of 2.65 being required at the .05 level.

Table 45 (see Appendix A) details the data for the adjusted synthesis means. Graphic representation of the data is found in Figure XII.

Table 46 presents the means for the various reading levels. The pupils in the upper two reading quartiles achieved equally as well with regard to the synthesis questions. There did exist significant differences between pupils at Quartile 4, Quartile 2, and Quartile 1. The results favored pupils at the higher reading quartiles. Pupils at Quartile 3 achieved significantly better with regard to synthesis than did pupils at Quartile 2 and Quartile 1. Differences also were significant between pupils at Quartile 2 and 1, with results favoring the upper quartile.

Table 47 (see Appendix A), concerning evaluation sub-test data, indicates an overwhelmingly significant F value for the treatment main effect. Pupils in Treatment A achieved significantly better in evaluation than did pupils in Treatment B. The main effect of reading level also proved significant. Pupils at upper reading levels were able to react more effectively to evaluation questions than were pupils at the lower quartile levels. The remaining main effect (sex) failed to achieve significance. Boys and girls dealt equally as well with evaluation questions. All of the interactions failed to qualify as significant. However, observation of the table reveals that the F value for the treatment by sex interaction is close to significance, 3.89 needed at the .05 level. It seems reasonable to assume that this interaction is positively affected by treatment.

The adjusted means of the evaluation sub-test scores may be studied in Table 48. The graphic patterns of the data are depicted in Figure XIII.

Table 49 supplies the adjusted means data for reading levels. Observation of this table denotes that pupils at Quartile 4 reacted more favorably to the evaluation sub-test than did pupils at Quartile 3, Quartile 2, or Quartile 1. A continuation of this pattern favoring the upper reading quartiles was observed when comparing Quartile 3 with Quartile 2 and Quartile 1. The differences between the two lower quartiles also proved significant.

Conclusions

From the covariance analyses conducted, the following conclusions are warranted:

1. Pupils using text-type materials with a cognitive-question emphasis upon analysis and evaluation (Condition A) did not differ significantly with respect to inference from pupils who received similar type materials with a dominant emphasis of knowledge questions (Condition B).

2. Higher-cognitive level questions (Condition A) produced significantly more caution overall among girls than was true of boys or girls using lower level questions (Condition B). The higher level questions stimulated more caution in boys than girls at the middle (Quartile 2 and Quartile 3) reading levels.

3. Pupils in Condition A in the lowest reading level over-generalized more than similar pupils in Condition B as well as higher than pupils in the highest reading levels (Quartiles 3 and 4) of Condition A and the highest reading level of Condition B. Pupils in the middle reading levels in Condition B over-generalized more than

pupils at either the lowest or highest reading levels in Condition B.

4. There were no significant differences in the discrimination scores of pupils between the two treatment conditions. However, pupils' reading level was related to their discrimination scores; better pupils in both conditions achieved higher discrimination scores than the poorer readers.

5. To the extent that the four I.T. sub-tests represented "critical thinking," the appropriate null hypothesis must be accepted. That is, with only minor exceptions, pupils using questions with a dominant emphasis on analysis and evaluation did not differ significantly with respect to critical thinking from those using questions predominantly of the knowledge type.

6. The employment of high-cognitive level questions (analysis and evaluation) produced significantly greater scores in social studies achievement than did low-cognitive level questions (knowledge). Better readers in both conditions achieved higher than did poorer readers. As a result of these significant differences, the major null hypothesis relating to social studies achievement must be rejected.

The following conclusions relate specifically to the six subtests incorporated in the achievement test.

7. The use of high-cognitive level questions (Treatment A) produced absolutely no difference upon pupils' ability to deal with

knowledge questions when compared with pupils who experienced the low-cognitive level questions (Treatment B). Better readers in both groups dealt more effectively with this area of the achievement test. An exception to this pattern existed between readers at the second and third quartile levels. Differences between these two groups were not significant.

8. Achievement in comprehension by pupils receiving materials with the dominant percentage of analysis and evaluation questions (Treatment A) did not differ significantly from the level achieved by pupils working with materials having the high percentage of knowledge questions (Treatment B). Pupils at the highest reading level comprehended better than pupils at the lower levels. Pupils at the three lower reading levels reacted equally well to the comprehension questions.

9. The employment of analysis and evaluation questions (Treatment A) produced higher application scores than did the use of knowledge questions (Treatment B), but the difference failed to achieve significance at the .05 level. The high-level questions did, however, enable boys to score significantly higher than girls on the application questions. Pupils in both treatments possessing high reading abilities scored more favorably on this sub-test than did pupils in the lower reading quartiles.

10. High-level questions (Treatment A) failed to produce significantly greater scores on analysis when compared to the low-

level questions (Treatment B). Even so, the total mean for Treatment A was higher than that for Treatment B. Also, failure to achieve significance at the .05 level was by a small margin. Actually the results favoring Treatment A were significant at the .06 level. Readers at the upper two quartiles dealt more successfully with the analysis questions than pupils at the lower two quartiles. Pupils at the highest quartile reacted more favorably than pupils at the other three quartiles. Pupils at the second quartile did not out-perform those reading at the lowest quartile. A significant interaction between treatment, reading level, and sex existed with regard to analysis data. This interaction, it seems reasonable, can be explained by the significant main effect of reading and the near significant effect of treatment.

11. Pupils experiencing the high-level questions (Treatment A) did not react more favorably to the synthesis questions when compared with pupils who experienced the low-level questions (Treatment B). Treatment also produced no differing effects upon the synthesis scores of boys or girls. Pupils at the upper two reading quartiles answered the synthesis questions with equal success. Pupils reading at the highest quartile level achieved significantly better regarding synthesis questions than pupils reading at the second and first quartiles. A similar pattern existed with regard to pupils at the third, second, and first reading levels. Pupils at Quartile 2, also scored better on synthesis than did pupils at Quartile 1. The interaction between treatment, reading level, and sex also was

significant. This significance can be interpreted as being primarily influenced by the reading scores of pupils.

12. Pupils who worked with the materials containing the analysis and evaluation questions (Treatment A) achieved significantly higher on the evaluation sub-test when compared with pupils who dealt with the materials containing the knowledge questions (Treatment B). Reading level also proved to be a significant factor influencing the answering of evaluation questions. Better readers scored higher than did poorer readers.

Relationships of Test Variables

The previous sections of this chapter have related conclusions obtained from covariance analysis of the data. This next section deals with data resulting from correlational analysis.* The prime reason for these further analyses was to shed some insight regarding the relationships existant among the various factors of the tests employed in the research. Tables 50 through 61 contain these data (see Appendix A).

Intercorrelations were calculated for both the pre- and post-critical thinking tests and the pre- and post-achievement tests. These data were analyzed for each treatment group separately.

Tables 50 and 51 report respectively the intercorrelations for the pre- and post-critical thinking scores for Treatment A, high-level questions. The pre-inference scores had a significant and moderately** negative correlation with caution scores. A significant and moderately positive correlation existed between inference and over-generalization while a low correlation was evidenced between inference and discrimination. Caution scores possessed a significant and moderately negative correlation with over-generalization.

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* Pearson's Product Moment Coefficient of Correlation

The correlational pattern exhibited in the pre-test data was reinforced after the children experienced high-level questions (see Table 51, Appendix A). The negative correlation between inference and caution rose from a significant-moderate standing to a significant-high standing. Correlations of significant-moderate standing existed between post-inference and post-over-generalization and post-discrimination, the latter correlation going from low to moderate.

At the termination of the experimental period, the significant negative relationship between caution and over-generalization test scores had intensified. There also was a change from a low non-significant negative correlation between caution and discrimination to a low significant negative correlation.

Intercorrelation data of pre- and post-critical thinking test scores for Treatment B, low-level questions, are presented

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** The terms slight, low, moderate, high and very high correlation are those suggested for certain correlation categories by Guilford in Fundamental Statistics in Psychology and Education. New York: McGraw-Hill Book Company, Inc., 1956.

in Tables 52 and 53. From examining these tables, it appears that more and higher level correlations existed for scores attained by pupils in Treatment B. However, the overall pattern of correlations relating to Treatment B is basicly the same as that exhibited for Treatment A.

A significant and high negative correlation was revealed between pre-inference and pre-caution for Group B. Significant positive correlations existed between pre-inference scores and pre-over-generalization and pre-discrimination. Caution scores were significantly negatively correlated with over-generalization and positively correlated with discrimination.

The post-test critical thinking data evidenced a very high negative correlation between inference and caution (see Table 53, Appendix A). The correlations between inference and the remaining two divisions of the test were also significant but were lower. Caution after the treatment revealed significant negative correlations with over-generalization and discrimination. The significant negative correlation between caution and discrimination is a change from a similar positive correlation exhibited before the experiment.

Tables 54 and 55 report intercorrelation data on the pre- and post-achievement sub-test scores for Treatment A. The majority of the significant correlations for the pre-test data fell in Guilford's low correlation category. A very low, almost negligible relationship existed between knowledge and application on the pre-test. A low significant correlation was exhibited between the knowledge and the total achievement scores. Comprehension was not correlated significantly with any factors of the test. However, a moderate significant correlation was manifested between comprehension and the total achievement score. Application and analysis demonstrated a definite but small significant relationship. A similar low order correlation was revealed between application and synthesis. A significant moderate correlation was present between application and the total achievement score. Analysis correlated with synthesis in a significant but low order. Analysis and evaluation also exhibited low correlations. A high correlation was evidenced between analysis and the total achievement score. Synthesis correlated significantly but in low order with evaluation. The correlation between synthesis and the total achievement score was moderate and significant. Evaluation also correlated with the total achievement score moderately and significantly.

The strength of the significant relationships between the various factors of the achievement test increased for Treatment A's post-test data (see Table 55, Appendix A). It appears that when children experience high-level questions the relationships between the various factors of achievement are increased. Knowledge and comprehension exhibited a significant, but low, correlation. This was also true for the relationships between knowledge and application, knowledge and analysis, and knowledge and evaluation. A substantial relationship existed between knowledge and the total achievement score. Comprehension correlated significantly with all the other factors of the test. The correlations were of low order. The correlation between comprehension and the total achievement score was moderate and significant. Application correlated moderately with analysis and synthesis, and lowly with evaluation. A substantial correlation was present between application and total achievement. Analysis had a substantial relationship with synthesis and a small but definite relationship with evaluation. A high correlation existed between analysis and total achievement. This was the sole high correlation in the post-test achievement data for Treatment A. Synthesis had a low correlation with evaluation. However, the relationship between synthesis and the total test score approached a high standing, using Guilford's categories. Evaluation correlated moderately with total achievement.

Intercorrelation data on the pre- and post- achievement test data for subjects in Treatment B are exhibited in Tables 56 and 57. Knowledge on the pre-achievement test did not correlate significantly with the other test factors. Knowledge only correlated moderately with the total achievement score. Comprehension exhibited a small but significant relationship with the analysis and synthesis factors of the test. A substantial relationship exhibited itself between comprehension and the total achievement score. Application revealed definite but small relationships with sub-test scores of analysis, synthesis, and evaluation. A substantial relationship existed between application and total achievement. Analysis demonstrated an extremely slight relationship with synthesis. A moderate correlation was disclosed between analysis and the total test score. Synthesis and evaluation revealed a low but significant correlation. A moderate significant relationship was present between synthesis and the total achievement score. Evaluation correlated moderately with total achievement.

The correlational pattern between the sub-test scores of the post-achievement test resembles somewhat that exhibited by the pre-achievement test scores. Knowledge on the post-test correlated significantly with application. This had not been true on the pre-test achievement data. Knowledge correlated with the total achievement test score moderately. This was similar to the same correlation on the pre-test data. Comprehension correlated slightly with analysis and synthesis. These relationships were somewhat less than on the pre-achievement test data. Comprehension exhibited a moderate correlation with the total test score. Application displayed a low but significant correlation with analysis and evaluation. A moderate correlation was present between application and total achievement. Analysis also revealed a low but significant correlation with synthesis and evaluation. A moderate correlation existed between this test factor and the total test score. Synthesis exhibited a slight but significant correlation with evaluation. A moderate correlation existed between synthesis and the total achievement score. Evaluation correlated substantially with the total test.

Tables 58 through 61 display the correlations between the factors of both the pre- and post-critical thinking and achievement tests. Table 58 represents the correlations between the pre-critical thinking sub-scores and the pre-achievement sub-scores for Treatment A. Inference on the pre-test did not correlate with any of the achievement subtests. Caution only exhibited a significant correlation with the total achievement score. Over-generalization exhibited negative correlations with all the pre-achievement subtests. Significant but slight correlations existed between over-generalization and the factors of analysis and total achievement. Discrimination exhibited the major number of significant correlations with the achievement subtests. Discrimination correlated in a low order with application. A substantial relationship existed between discrimination and analysis. Slight, but nevertheless significant correlations involved discrimination and the subtests of synthesis and evaluation. A moderate correlation was present between discrimination and the total achievement test score.

Correlational data between the post-critical thinking and post-achievement test scores for Treatment A comprise Table 59. The correlational pattern is somewhat similar to that of the pre-test data. Inference did reveal a very slight but significant correlation with knowledge. The remaining correlations between inference and the other achievement subtests proved nonsignificant. Caution did not correlate with any factor of the achievement test. Over-generalization revealed a slight correlation with comprehension. Low but significant negative correlations were in evidence between over-generalization and analysis, synthesis, and total achievement. Discrimination was significantly correlated with knowledge, analysis, and total achievement.

More significant correlations existed between the factors of the pre- and post-tests administered to Treatment B subjects. This is discernable from observation of Tables 60 and 61. In Table 60, dealing with pre-test data, inference was significantly correlated with comprehension, application, analysis, synthesis, and total achievement. Caution possessed an extremely slight significant negative correlation with total achievement. Over-generalization did not correlate significantly with any factors of the pre-achievement test. Discrimination was slightly correlated with knowledge and evaluation. Low but definite correlations were evidenced between discrimination and total achievement.

A similar pattern of significant correlations revealed itself in the post-test data for Treatment B subjects (see Table 61). Significant low correlations existed between inference and application, synthesis, evaluation and total achievement. Caution correlated significantly and negatively with synthesis and total achievement. However, the latter correlation was slight. Over-generalization exhibited slight negative correlations with application and analysis. A slight correlation was present between discrimination and comprehension. Discrimination correlated in low but significant order with the remaining achievement subtests: application, analysis, synthesis, and evaluation. A similar order correlation existed between discrimination and total achievement.

The significance of these relationships between the subtests of the two tests employed in the experiment comprise the discussion section of this report, Chapter IV.

Conclusions Regarding Correlations

1. With regard to the intercorrelations of the critical thinking scores, the correlational patterns present on the pre-critical thinking scores for both groups were more or less maintained as a result of the experimental treatment. In other words, those factors on the critical thinking tests that exhibited significant correlation on the pre-test, displayed similar significant correlations on the post-test. Even the directions of the correlations exhibited on the pre-test were maintained for the most part. Treatment conditions did not alter this pattern.

2. The pre-achievement data for both treatment groups exhibited almost negligible intercorrelations between the various test factors. If a correlational pattern does exist in the two treatment conditions, the intercorrelations are so slight as to make drawing conclusions very tenuous. About the only statement that can be made with some certainty is that each factor correlated significantly with total achievement.

3. After the experimental period, the intercorrelations between the various factors of the achievement test increased slightly in magnitude for those pupils who dealt with the high-level questions. In fact, all factors, with one exception, of the post-test for Treatment A data correlated significantly with the other test factors. The sole exception was a nonsignificant relationship between knowledge and synthesis.

4. At the experiment's completion, intercorrelations of scores for pupils who had dealt primarily with the knowledge questions (Treatment B) changed little from the pre-test pattern. While it seems that the dominance of analysis and evaluation questions in Treatment A did strengthen the correlations between the factors of the achievement test, the emphasis on knowledge questions of Treatment B did not. However, these conclusions are advanced cautiously.

5. The correlations between the factors of the pre-critical thinking test and the pre-achievement test for pupils who experienced the analysis and evaluation questions (Treatment A) changed only slightly as a result of the experiment. In fact, the correlations between the pre-test factors exhibited more significant correlations. This was especially true with the correlations between the discrimination factor and application, analysis, synthesis, and evaluation.

6. Overall, there were more significant correlations between the factors of the critical thinking and achievement tests

taken by the pupils who received the dominance of knowledge questions. A similar pattern was evident for both the pre- and post-tests. The experimental treatment did not seem to exert any influence on the correlations of scores of pupils in Treatment B. In both the pre- and post-test data, the significant correlations concentrated on the same factors. Inference on the pre-critical thinking test correlated significantly with comprehension, application, analysis, synthesis, and total achievement. Discrimination correlated significantly with all of the pre-achievement test facts. With respect to post-test data, inference correlated significantly with application, synthesis, evaluation, and total achievement. Discrimination, after the experimental period, significantly correlated with all the factors of the achievement tests plus total achievement, with the exception of the knowledge subscore.

Summary

Pupils' use of analysis and evaluation questions in text-type materials did not produce significant differences in critical thinking when compared to their use of knowledge questions in text-type materials. This failure to reach significance was evidenced by the analyses of three of the four sub-tests of the Social Studies Inference Test: inference, over-generalization, and discrimination. However, analysis and evaluation questions did produce significantly more caution in pupils than did knowledge questions. Reading ability was revealed to be a significant factor in pupils' discrimination scores in both treatments. Reading level significantly interacted with treatment in both caution and over-generalization. The null hypothesis stating that the higher-level questions would not stimulate increased critical thinking must be accepted. However, the null hypothesis which stated that pupils who used the higher-level questions in text-type materials would not differ significantly in social studies achievement from pupils who used the knowledge questions in text-type materials must be rejected. Reading level was also found to be related to social studies achievement.

Correlation Summary

Correlational analysis of the data relating to the critical-thinking test factors showed relationships to be rather uninfluenced by the experimental treatments. Relationships evident at the commencement of the experiment were evident at the conclusion of the experiment. One might cautiously conclude that this lack of basic correlational change agrees in part with the no significant differences that were revealed by submitting the data to covariance analyses.

Attending to the achievement data, correlational analysis revealed that the experiment influenced favorably the intercorrelations between the achievement subtests for those students who experienced the high-level questions. This was not the case with regard to the data of pupils who had experienced the knowledge questions. These results, which should be considered with great caution, seem to be in agreement with the implications drawn from the covariance analyses of the achievement data.

Chapter IV will discuss these results and suggest implications from the study for the social studies program, for the curriculum in general, and for further research.

CHAPTER IV

DISCUSSION

This research sought to determine whether a dominant use of analysis and evaluation questions in sixth grade social studies text-type materials would effectively stimulate the development of pupils' critical thinking and achievement. The study, exploratory in nature, investigated a general problem which has not had research attention.

Questions and Critical Thinking

In this experiment, the use of the higher cognitive level questions, specifically those demanding analysis and evaluation, did not stimulate critical thinking in pupils to any greater degree than was true of pupils who used low cognitive level (knowledge) questions. That analysis and evaluation questions did not stimulate an increase in critical thinking is not a simple conclusion; plausible reasons to explain this finding are necessarily complex.

At the outset, critical thinking must be seen as a vague concept; its common use frequently suggests that it is a slogan rather than a precisely formulated idea. The lack of instruments to measure this type of thinking testifies to the difficulty of bringing adequate definition to the concept.

Consequently, a possible reason for the failure of the high level questions to stimulate critical thinking perhaps should not be attributed to the questions used, but rather to a faulty criterion measure, the Social Studies Inference Test. This test provides no overall score, and each sub-test score alone does not comprise critical thinking.

Indeed, the test at the time of the experiment existed in only an experimental version, and its developer (Taba, 1964) made no claim that it would provide an adequate measure of gross critical thinking. With these obvious inadequacies, this test remains the only reasonably suitable instrument to assess critical thinking of elementary school pupils. Additional and more satisfactory instruments to measure critical thinking need to be developed so that critical thinking can be analyzed, measured, or proven to be, in reality, non-existent. Particularly useful would be the analysis of present tests (at secondary and adult levels) which purport to measure critical thinking in order to determine if specific factors (e.g. similar to the "structure of intellect model"[Guilford, 1956]) exist in them.

The restriction of pupils to answering questions with no opportunity for discussion may have tended to reduce their enthusiasm and to stifle their development of critical thinking. Discussion of the materials and the questions by teachers and pupils possibly would have contributed to greater and perhaps significant differences between the two treatment groups. Critical thinking would seem to demand that pupils be given the opportunity to reflect, to discuss, and to question further. The absence of this opportunity may very well have served as a deterrent to the pupils' development of critical thinking. Too, pupils might have been affected adversely because of lack of teacher interaction. Pupils are accustomed to the teacher playing a dominant role in the classroom. Yet, in this investigation, the teacher served only to coordinate the pupils' use of the materials.

Another possible reason for the observed non-significant difference between the groups might be attributed to the strategy of presenting questions. Pupils might have done better in Condition A had a strategy been incorporated into the experiment whereby they used a dominance of low-level knowledge questions first and then utilized higher-level analysis and evaluation questions. This possibility seems particularly intriguing and merits specific research.

Pupils in Condition A may have developed no increased critical thinking because of their lack of experience with high level questions in their previous classroom learning activities. Pupils, typically, are confronted with questions requiring the return of information which has been presented by the teacher. It is not common for pupils to experience questions that ask them to react to and to manipulate information. Pupils lacking this experience may not have had the prior learnings necessary for dealing with the sudden confrontation of questions demanding that they think with the knowledge they possess. However, this possible reason is not compelling, for pupils in Condition A, using high level questions, increased their social studies achievement.

The length of the experimental period may not have been sufficient to stimulate critical thinking in those pupils using the analysis and evaluation questions as contrasted with those pupils using the knowledge questions. Fostering complex cognitive functions probably demands an extended time. However, other studies report the stimulation of critical thinking in a similar time period. These studies (Cousins, 1963; Elsmere, 1963; McGarry, 1961) may not have measured critical thinking but rather a special type of achievement. That is, learning the use of a particular model for thinking (e.g. a procedure of "problem solving") probably represents a significant and useful achievement, but not necessarily an increase in the ability to think critically.

The failure of analysis and evaluation questions to stimulate critical thinking may have its strongest explanation in the possibility that critical thinking is an ability, or abilities, which cannot be taught, but only improved to some unknown degree. Perhaps critical thinking is analogous somewhat to intelligence. One does not teach to improve intelligence; one only teaches so that its potential will be utilized. Perhaps, critical thinking must also be viewed in a similar light. A teacher may not be able to teach critical thinking; he can, however, work to make sure that this ability, inherent in each pupil, is utilized to its potential. It seems that this possible explanation is the most far reaching in its implications for education. If critical thinking is an ability, then pupils will not be taught to think, but will be provided opportunities which will develop their ability. Methods and strategies of teaching would have to change. The objectives and techniques of evaluation of critical thinking, then, by teacher-made or standardized tests, would have to be appropriately readjusted. Likewise, research concerned with critical thinking would have to be reoriented. In this regard, the achievement results obtained in this study might be interpreted as a measure of pupils' potential to think critically. Empirical research adding to the plausibility of viewing critical thinking as an ability, or cluster of abilities, is that completed on the nature of problem solving (Merrifield, Guilford, Cristman, and Frick, 1962). This research revealed that problem solving does not exist as a unitary ability. Rather, it must be considered as multiple abilities.

Questions and Social Studies Achievement

Use of higher cognitive level questions (analysis and evaluation) in text-type materials stimulated a statistically higher social studies achievement than did the use of lower level (knowledge) questions. This conclusion by itself is encouraging. However, it is necessary to look at the various sub-test results of this achievement data to ascertain where achievement differences existed between the two groups.

Attending to the first category of the achievement test, knowledge, the data revealed no significant differences. Pupils in both treatment groups were equally able to deal with questions dealing with specific facts. This result seems only natural in that both high-level and low-level questions require pupils to deal with specific facts.

That both groups achieved equally well on the test's comprehension questions can perhaps be attributed to the fact that both groups were dealing with the same textual passages. Even the knowledge questions directed the pupils' attention to the content of the text. The comprehension questions on the achievement exam required the pupils only to translate or interpret. Another possible reason for no difference is that pupils in most classrooms have already had some demands to comprehend materials. Such questions were not entirely a new emphasis for the children. A third plausible reason for both groups doing equally well on comprehension is that pupils in both treatments did have some comprehension questions in their materials. Another reason may be that reading in school is mainly interpretation and translation (aspects of comprehension). The main effect of reading influenced the results. Pupils at the highest reading quartile out-performed pupils at the lower levels. Perhaps the influence of reading ability can account for part of the lack of difference between the treatment groups. Comprehension may be more affected by ability to read than by the type of questions encountered.

The application data although favoring pupils in Treatment A failed to achieve the necessary significant F value (.05 level). More time than the experiment provided may be required for developing in pupils facility in dealing with application questions. However, this interpretation is somewhat questionable since boys did significantly better than girls in dealing with such questions. This greater achievement of boys may have been due to greater interest. The content dealing with Africa and Oceania may have more favorably motivated boys to use this particular information. It also is possible that boys were more stimulated by questions that required them to apply mentally understandings and facts which they possess.

To pinpoint the reasons for the significant differences favoring boys on the application subtest is difficult considering the small number of questions on the subtest. More profit can be derived from the data if one approaches it as being suggestive rather than conclusive. The entire experiment is suggestive, a beginning. This nature of the investigation needs to be borne in mind, less the reader infer that which is not implied.

The data on analysis, even though favoring pupils who had experienced the high-level questions, did not evidence a significant difference (.05 level). The failure of the analysis questions to produce significant results between the two treatment groups may testify to a close relationship between the Taxonomy levels of analysis and comprehension. The separation of the two categories by application may not be sufficient. Whether a question ranks as analysis or comprehension seems related to the degree of information afforded the pupil. The less information presented the pupil, the more he is forced to analyze.

If this close relationship does exist, it may cautiously be considered a partial explanation for the similar achievement of the treatment groups on the analysis questions. The fact that reading influenced the results of both analysis and comprehension may also partly account for the non-significant differences between the treatments. Pupils in Treatment B did experience some analysis questions. Perhaps this small number of analysis questions provided these pupils with a more intellectually stimulating array of questions than they might have had before. This could have affected the experiment's results. However, it must be admitted that this explanation is based on a tenuous assumption.

Another reason for the failure of analysis questions to stimulate the ability to deal effectively with such questions on the achievement test could be that the pupils may have lacked school experiences that would foster analytic skill development. Analytical skills are dependent upon pupils' training in logical types of thinking. Lacking such training, it seems, would greatly hinder pupils' ability to use such questions. The four weeks of the experiment may not have been sufficient to correct such a cognitive deficit.

The synthesis questions on the achievement test required of pupils the derivation of a set of abstract relations. The other two categories of synthesis, production of a unique communication and production of a plan, are not possible to construct in a multiple choice item.

Consequently, the similar results obtained by both treatment groups may be explained in that pupils in both groups might have experienced enough synthesis questions to enable them to recognize abstract relations between data presented. Treatment B pupils did have some questions at all levels of the Taxonomy. It is also plausible that for pupils to gain sophistication in the synthesis questions requires greater duration than the four weeks allowed in the experiment.

The overwhelming results of Treatment A pupils regarding evaluation is more encouraging. Of course, caution must be maintained. Even so, that high-level questions assisted pupils in dealing more effectively with evaluation questions carries many ramifications.

According to the Taxonomy, evaluation is the highest cognitive operation. It subsumes the categories of synthesis, analysis, application, comprehension, and knowledge. If this be true, and there is increasing research evidence to attest to this hierarchy, then success in the evaluation category by pupils in

Treatment A assumes that these pupils have obtained competence in the categories lower in the hierarchy. This result may somewhat alter the real meaning of the similarities of the two groups' performance in the other categories of the achievement test.

Analysis of the evaluation data suggests that questions requiring analysis and evaluation stimulated individuals to utilize several viewpoints regarding the information embedded in the task. It seems reasonable that pupils, using such questions, might have been forced to engage in the intellectual activity of considering various aspects of factual knowledge and evaluating the complexity, implications, and applications of such knowledge. Such mental "juggling" may have enabled pupils to know better the information with which they were dealing.

Pupils, by experiencing such questions, probably evaluated information for its relevance. Sorting of the relevant from the irrelevant probably was required. Pupils' drawing of warranted conclusions may have been encouraged. Such intellectual activities probably gave greater clarity to the instructional content under consideration. Trivial information probably was canceled, thus allowing pupils to form clearer understandings of the information they possessed.

Regardless of treatment group, reading exerted a significant influence upon each one of the subdivisions of the achievement test. Better readers out-performed poorer readers. This result is not surprising. The text-type materials demanded reading ability on the part of the subjects. Pupils had to read the text book, and they had to read the test questions carefully.

It would seem that one could maintain caution and still consider that in each area of the achievement test, the better readers influenced the results upward. The graphic representations of the data testify to this. However, better readers often come from homes having many reading sources. High reading ability is closely correlated with good achievement in school. The similar results between the treatment groups on knowledge, comprehension, analysis, and synthesis may be explained by the fact that the better readers in the Treatment B (knowledge questions) had their ability, their backgrounds, and their interests to assist them in raising their group's total score.

One quality of a good reader is critical mindedness. The similarity of results in several sections of the achievement test might be attributed to the fact that good readers in Treatment B asked themselves high-level questions even though confronted with only knowledge questions. Research conducted by Rothkopf (1967) seems to add credence to this.

One might examine this discussion and state that the good reader will do well at all levels of achievement regardless of the types of questions he receives. But, not so. On the evaluation subtest the better readers in Treatment A out performed better readers in Treatment B. The point to be made, however, is that reading dominates the learning situation and must be considered as exerting varying significant effects upon pupils' achievement at times regardless of the types of questions they experience.

That data relating to five levels of the achievement test did not reveal significant differences between the groups also may be explained by the nature of the experiment. The absence of discussion may have had a detrimental effect upon achievement, just as it possibly did on critical thinking. Also, the duration of the experiment may have been too short to influence all levels of achievement. It is probable that different levels of achievement would require different time periods for mastery.

The reliability of the achievement test (.68) is rather low, and the reader should bear this in mind when considering the total results. A strengthened criterion test might yield somewhat different data.

The suggestiveness of the data should be no cause for alarm. This research stands as a beginning, not as a monumental conclusion, regarding the effects of questions. It is premature to make definite statements. High-level types of questions do have the potential, it seems, to make pupils intellectually uneasy and to encourage them to probe their knowledge and discover increased meaning.

Correlations and Inter-correlations

As mentioned in the previous chapter, the pattern and magnitude for the inter-correlations for both the pre- and post-critical thinking test data were quite similar. The high correlations existed between the same elements regardless of whether one was dealing with the data for pupils in Treatment A or Treatment B. Interpretation of such patterns involves much speculation. Such speculation would have to be checked in further experimentation before one could have great faith in its credence.

It is possible that the analysis and evaluation questions which were interpreted to comprise prime factors of critical thinking were not in fact the same factors which the Social Studies Inference Test measured by inference and discrimination. This test itself has undergone modifications since the experimenter employed it.

However, discounting the above as a possibility, and examining the inter-correlations themselves, one can discern a pattern which is logically consistent. For instance, the high negative correlations between inference and caution in Tables 50 through 53 (see Appendix A) are not too surprising. One would expect that a person who did well drawing inferences would not be an overly cautious person. Likewise, a person who drew many inferences might be prone to over-generalize and discriminate to a fairly high degree. The intercorrelations support this. Moreover, a person who was extremely cautious would tend to score low on over-generalization. Again the tables of intercorrelations bear this out.

Such intercorrelations seem to attest to the validity of the Social Studies Inference Test. If this is the case, then one might be misguided to believe that the high-level questions, analysis and evaluation, would alter these relationships. It is perhaps noteworthy that the high-level questions did strengthen the relationships somewhat, although the increase was not significant. The lack of correlational differences among the critical thinking data of the two experimental groups may also be due to the short duration of the experiment. The reader is reminded that no significant changes in critical thinking resulted from the experiment. Perhaps the reasons suggested for that finding are applicable to some extent in explaining the similarity of the intercorrelation data.

In examining the intercorrelations of the achievement data for Treatment A (Tables 54 and 55, see Appendix A), one can see that the relationships increased somewhat after the experimental period. Such was not the case with the intercorrelations for the factors of Treatment B test data (see Tables 56 and 57, Appendix A). It is possible that pupils who experienced the high-level questions were able to relate the various aspects of achievement to a better degree. To say that one group of questions, analysis and evaluation, led pupils to interrelate knowledge information while another group of questions, knowledge, failed to do this is rather tenuous considering the small values of the correlations. Only added investigation can add credence to these statements which are, at this time, not much more than hypotheses.

The data presented in Tables 54 through 57 testify to the fact that the achievement test had six rather distinct factors.

Although many of the correlations are significant this fact should be expected since the Taxonomy categories are hierarchically, and thus logically, related. When considering the correlations between the critical thinking test and the achievement test data for Treatment A (see Table 58, Appendix A), it is clearly evident that significant correlations are at a minimum. A plausible explanation of the lack of correlation might be that in reality the tests measured different things: critical thinking and achievement. Caution and over-generalization could very well have no relationships with factors in a multiple-choice achievement test. And the test form could have been a factor. An achievement test possessing an easy format might have stimulated relationships with these two critical thinking factors. The significant correlations existing between discrimination and the factors of application, analysis, synthesis, and evaluation and total achievement are not startling. One would expect that an individual capable of discrimination behavior would also be able to achieve well on various types of achievement questions.

That correlations of significance decreased (See Table 59, Appendix A) after the experiment might suggest that the use of high-level questions tended to make the achievement and the thinking aspects of pupils performance more distinct, thus less related. Further investigation is needed to explain why such a trend would develop.

The correlation between the critical thinking test factors and the achievement test factors for pupils in Treatment B exhibited a more definite pattern. Significant correlations for both pre- and post-test data existed between inference and most of the achievement factors (see Tables 60 and 61, Appendix A). Significant correlations also existed between discrimination and all of the achievement test factors in the pre-test and all but the knowledge factor in the post-test.

There was a slight similarity to this correlation pattern, e.g. the discrimination factor, with the pre-test data for pupils in Treatment A. Such results for Treatment B pupils seem to suggest that pupils who can draw inferences and make discriminations are able to do well on the various levels of achievement. This result, which seems quite logical, is open to doubt because of the correlation results present for Treatment A data. The question remains unanswered why high-level questions would not stimulate such relationships.

One explanation for these results might be that the low-level questions did not serve to separate the factors of thinking and achievement as was the case with the high-level questions. Had they done so, the relationships between the inference and discrimination factors and the achievement factors might also have been lowered.

The correlations are somewhat confusing. Part of this is due to the small magnitude of the relations even though significant. Another plausible reason for this lack of clarity in the correlation data might well be due to the low reliability (.68) of the achievement test.

Observing the correlations for treatment B (Tables 60 and 61, see Appendix A), one might conclude that the significant relationships existing between the two critical-thinking test factors, inference and discrimination and the majority of the achievement test factors may be evidence to support the fact that the achievement test was also a test of critical thinking. Again such a contention would have to survive further investigation.

It is readily apparent that additional experimentation is necessary before more certain explanation of the correlational data can be presented. Nevertheless, such results seem to offer a challenge to seek further into how various types of questions affect the learning and thinking of individuals.

Implications of the Study

The implications of this study deal specifically with the social studies but can, without losing validity, be applied to the curriculum in general. The differing influences of the high level questions upon pupils must receive attention. Pupils with varying abilities (e.g., reading) are affected differently by questions having diverse cognitive emphases. Teachers, for example, need to realize that certain kinds of questions are capable of influencing pupils in predictable ways. If subsequent research clarifies the relationships of types of questions to types of pupils' abilities, then teachers with this knowledge will be able to match their questions with instructional goals and specific groups of pupils.

When teachers wish to achieve a particular cognitive objective, they will be able to choose a definite type of question to influence specific groups of pupils. They will be better able to incorporate an effective strategy of questioning into their teaching. At this present state of knowledge, teachers should realize that if they desire to stimulate critical thinking by the use of high level questions, for example, pupils at the higher reading levels are likely to become more cautious in dealing with information. If teachers realize this possibility, they may still proceed to use such questions, but should do so in light of the probable consequences. Teachers must have the sophistication necessary to realize what types of questions influence pupils in certain ways. Additional research following this study should provide the substantive background for the desired sophistication. At present, the usable information is too meager and restricted to be of comprehensive use.

The role of the question is still imprecise with regard to critical thinking. The failure of the high-level questions to stimulate such thinking forestalls the simple conclusion that if the right questions are framed, pupils will think critically. The findings possibly suggest that the knowledge question has more value than it has been accorded in the stimulation of thinking. The knowledge questions (in Condition B) did not cause pupils to think less. Well thought out questions, whatever their cognitive demands, are important, but perhaps there is a certain "best" strategy for using effectively constructed questions. This possibility, not a part of this study, deserves careful consideration and attention in subsequent research. The use of analysis and evaluation questions in a longer study is suggested. Also valuable would be an investigation of the affects that the training of teachers in the use of high-level questions in classroom discourse would have on pupils' critical thinking. Research development of tests to measure critical thinking is an obvious necessity. Instructional materials need to be developed and field tested that will aid pupils to use high-level cognitive procedures. Too, basic research is required to determine if critical thinking is really a cognitive ability capable of being developed.

Several implications may be drawn from this study regarding the role of questions in relation to social studies achievement in particular and overall school achievement in general. If questions at higher cognitive levels are capable of stimulating high achievement, then teachers should be using these questions in much greater numbers than they currently do. Teachers, by improving their level of questioning, could very well make information more meaningful for their pupils. In addition pupils whose teachers use these types of questions should be expected to employ such questions themselves when they engage in class discussions and other class work. Even when pupils work alone, their questioning habits might be expected to reflect the questioning emphases with which they are familiar in the classroom. Higher level questions not only should stimulate higher levels of achievement, but also should make pupils better inquirers into the realms of knowledge.

Publishers of educational materials should be able to translate these findings into reality with ease. Presently, most textbook questions have a low cognitive emphasis. This study suggests that if book publishers raised the cognitive level of the questions in their texts, they would provide a learning tool with increased merit. Questions in workbooks, in like manner, could also be improved. A conscious effort on the part of publishers of these materials with regard to the level and sequencing of their questions might lead to achievement gains of significant magnitude. Teachers' guides, accompanying these materials, should deal with the nature of the question from a standpoint of cognitive emphasis, not merely with respect to form or an admonition (e.g. asking more "why" rather than "what" questions). What are the cognitive demands of the question? should be one of the major criteria for judging questions. The form of a question should be considered in relation to the narrative to which it refers.

The results of this study with regard to achievement also have implications for test makers (whether teacher or professional) and for publishers of various audio-visual materials such as motion pictures, film-strips, and still pictures. What are the cognitive emphases of the questions in a test? Are the emphases of the questions in these materials consistent with the instructional objectives and with the emphases of the questions which have been employed in the classroom? Such a consistency of cognitive question emphasis seems necessary for optimal pupil learning.

Since the question is important to pupils' learning, supervisors should be concerned with the level of teachers' questions, not only those verbalized but also those which are written. Supervisors should realize that high-level questions are effective with elementary pupils, at least those at the sixth grade level. More may be expected of pupils than the memorization of information. Classroom questions should be considered in relation to the interaction of teacher and pupils. Do questions make the pupils become active learners, active inquirers? The conclusions from this study seem also relevant to the process of textbook selection. For example, selection procedures should incorporate attention to the cognitive levels of questions, not simply to the form of the questions included in the book.

The study has demonstrated the merit of Bloom's Taxonomy as a tool capable of guiding question construction and of giving direction to various aims set by teachers. If teachers are aware of the Taxonomy and its various hierarchical levels, then it is conceivable that they will be provided with a tool which can help improve their questions. The Taxonomy can provide guidance not only for formulating oral questions, but can assist teachers in constructing questions for their tests and worksheets. The assignments of teachers can become challenges to think as well as instruments to increase pupils' knowledge.

Research on the teaching act should not continue to be vague regarding the questioning aspect of teaching. An observation guide like the OScAR (Medley and Mitzel, 1958) may not profitably categorize all questions of teachers as "problem structuring." "Teachers ask questions" on an observation schedule (Flanders, 1950) reveals nothing about the questioning of a teacher except that he poses questions. In the future, observation procedures should be specific in their analysis of teachers' questions. Some work is beginning to be directed to this need (Clegg, 1967; Davis and Tinsley, 1967). The research extensions of present observational devices are steps in the right directions, but these instruments still do not go far enough in recording and analyzing the complexity of the question in the classroom.

Recommendations for Further Study

Replication of this investigation is an obvious suggestion. Such studies would be informative and would provide additional bases for conclusions. Modifications of this study can also be productive. For example, the time period could be lengthened and the number of subjects increased without any drastic change in the format of the investigation. Investigations using samples different from the one in this experiment also would provide a broader base for generalization. Future research might incorporate questions with specific cognitive emphases within textual narratives and at the end of textbook chapters.

Another possibility for additional study would include training some teachers to form specific types of questions and examining the critical thinking and social studies achievement of their pupils. Results thus obtained could be contrasted with those gathered from pupils whose teachers had not received such training. Such a study might last for a year and would add clarity to points such as the following: can teachers be instructed in better questioning techniques? and, does better questioning by teachers improve pupils' critical thinking and achievement in social studies? Further investigations should be directed to the effects of high cognitive level questions in teacher-guided discussion as opposed to discussion where questioning had no predetermined or definite cognitive emphasis. Similar studies could employ the use of a television teacher using questions with predetermined high-level questions.

Another study might incorporate the training of pupils in a class situation to form their own questions. Such training in the anatomy of the question might enable pupils to gain greater insights into their quest for knowledge. Such instruction might be part of training pupils in the art of discussion.

Of course, these recommendations for further study can apply to other areas of the curriculum in addition to the social studies. Are certain types of questions more productive in certain subject areas? For example, will analysis questions employed in sixth grade science stimulate an increase in critical thinking and achievement? Will evaluation questions in the study of literature foster pupil understanding? Additional study can provide the empirical evidence needed to answer such questions.

Concluding Statement

This investigation has initiated a line of inquiry into the nature and influences of classroom questions. Pupils are confronted by questions posed by teachers, in textbooks, in other instructional materials, and by other agents. Thus, an understanding of the complexities of the question is crucial to improvement of education. The conclusions yielded by this investigation merit additional attention. Can high level questions, under different circumstances, foster critical thinking? What will be the effect on social studies achievement if a definite strategy of questioning is employed? Will similar results be obtained if pupils different from those in the present study serve as subjects? The time is propitious to continue the investigation of the impact of specific kinds of questions upon pupils' intellectual growth so that presently held assumptions may be substantiated, modified, or discarded.

CHAPTER V

SUMMARY

Problem and Objectives

The effective use of classroom questions by the teacher and in instructional materials is one means of achieving described educational objectives. The actual technique of forming and using good questions is recognized as difficult. It is evident that attention to specific types of questions and the resulting pupil behaviors has, for the most part, been slighted by research. When attention has been present, it has focused primarily on tallying and describing the types of questions teachers employ or educational materials contain. Before this present investigation, no attempts at manipulating types of questions had been undertaken.

This study sought to determine whether a dominant use in social studies text-type materials of analysis and evaluation questions, as defined by Bloom's Taxonomy, would effectively stimulate the development of sixth grade pupils' critical thinking and social studies achievement. The overall hypothesis tested, stated in null form was:

Use of text-type materials employing questions requiring "analysis" and "evaluation" will not result in differences in sixth grade pupils' critical thinking and social studies achievement when compared with the use of text-type materials incorporating questions requiring the recall of knowledge in relationship to pupils' (a) reading level, (b) sex, and (c) the interaction between these variables.

The investigation was concerned with various levels of achievement representative of the categories of Bloom's *Taxonomy*: knowledge, comprehension, application, analysis, synthesis, and evaluation. The composite of these various levels of achievement represented total achievement, the data of which were submitted to various analyses.

Procedure

Two hundred and sixty pupils enrolled in eleven sixth grade classes of a large suburban school system served as subjects. Classes were randomly assigned to either experimental Condition A, dominant emphasis (50 per cent) on analysis and evaluation questions, or Condition B, dominant emphasis (90 per cent) on knowledge questions. From the school's cumulative records, pupils' intelligence quotients and reading achievement scores were obtained. The *Social Studies Inference Test* (Hilda Taba, 1964) and the social studies achievement test developed by the investigator served as criterion measures of critical thinking and achievement respectively and were administered prior to and immediately following the experiment.

During the experimental period of four weeks, specially prepared materials were used by pupils in each treatment condition.

For Condition B, these materials contained predominantly knowledge (Bloom category one) questions. Materials employed in Condition A contained a dominant emphasis on analysis and evaluation questions (Bloom category four and six). Each set of materials had a corresponding answer sheet with which pupils checked their answers.

While pupils used the experimental materials, teachers did not engage in any direct teaching, but coordinated the materials in their classes. At the end of the experimental period, both the Social Studies Inference Test and the achievement test were administered as post-test measures.

Analysis of covariance was the principal method utilized in analysis of the data. The pre-tests were employed as the covariants. Reading level and IQ data were subjected to analysis of variance to ascertain if these factors should also be employed as covariants. No significant differences in IQ were revealed between the two treatments, between boys and girls, or their interaction. Thus, IQ was eliminated as a possible covariant on subsequent analyses of the criterion data. No significant difference between reading achievement was noted between the two treatments and no interaction either. A significant difference did exist for the sex variable. However, this fact was not considered sufficient reason to use the reading scores as covariants on subsequent analyses of criterion data.

The Social Studies Inference Test lacked a total score, but contained four sub-scores: inference, caution, over-generalization, and discrimination. The social studies achievement test produced a total achievement score and six sub-scores, each representative of a level of Bloom's Taxonomy.

The data from these two tests, besides being submitted to covariance analyses, also were subjected to correlational analyses.

Results

Covariance analyses revealed that pupils' use of analysis and evaluation questions in text-type materials did not produce significant differences in critical thinking when compared to pupils' use of knowledge questions in text-type materials. This failure to reach significance was evidenced by the analyses of three of the four sub-tests of the Social Studies Inference Test: inference, over-generalization, and discrimination. However, analysis and evaluation questions did produce significantly more caution in pupils than did knowledge questions. Reading ability was revealed to be a significant factor in pupils' discrimination scores in both treatments. Reading level significantly interacted with treatment in both caution and over-generalization. The null hypothesis stating that the higher-level questions would not stimulate increased critical thinking must be accepted.

However, the null hypothesis which stated that pupils who used the higher-level questions in text-type materials would not differ significantly in social studies achievement from pupils who used the knowledge questions in text-type materials must be rejected.

Treatment A's pupils' achievement was significantly greater than that of Treatment B's pupils' achievement. Analyses of the various sub-achievement tests indicated that the sole significant difference between the treatment conditions was with regard to evaluation. But, the results approached significance favoring Treatment A in both the application and analysis sub-test data. Reading level also was found to be related to social studies achievement with better readers achieving significantly better than pupils with less reading ability.

Correlational analysis of the data relating to the critical-thinking test factors showed relationships to be rather uninfluenced by the experimental treatment. Relationships evident at the commencement of the experiment were evident at the conclusion of the experiment.

Submitting the achievement data to correlational analysis revealed that the experiment influenced favorably the intercorrelations between the achievement subtests for those students who experienced the high-level questions. Such favorable influence was lacking with regard to the data of pupils who had experienced the knowledge questions.

Further analyses revealed that there were more significant correlations between the factors of the critical thinking and achievement tests of pupils who received the dominance of knowledge questions than were evident between the test factors of pupils who experienced the analysis and evaluation questions. A similar correlational pattern was evident for both the pre- and post-tests, thus the experimental treatment did not seem to exert any influence.

Discussion

The results of the experiment revealed that the use of analysis and evaluation questions did not stimulate critical thinking in pupils to any greater degree than was true of pupils who used knowledge questions. Plausible reasons to explain this finding are necessarily complex.

One reason for this result could be that the criterion measure, the Social Studies Inference Test was not adequate to measure critical thinking. Taba in designing the test made no claims that the four sub-scores would provide an adequate measure of gross critical thinking.

Another reason could be that the restriction of pupils to solely answering questions with no opportunity for discussion may have tended to reduce their enthusiasm and to inhibit the development of this type of thinking. Lack of teacher interaction may also have produced a negative effect.

Another reason offered to partially explain the results is that pupils in Condition A, with no previous experience with high-level questions, lacked the necessary background skills to stimulate the development of critical thinking. The experiment's length may not have provided enough experience to overcome the deficit. Also perhaps the length of the experiment was not sufficient to develop such a complex cognitive skill.

The strongest explanation for the failure of high-level questions to stimulate critical thinking may be that critical thinking is an ability, or abilities, which cannot be taught, but only improved to some unknown degree. Perhaps critical thinking is analogous somewhat to intelligence. One does not teach to improve intelligence; one only teaches so that its potential will be utilized.

The conclusion that the use of higher cognitive level questions (analysis and evaluation) in text-type materials stimulated a statistically higher social studies achievement than did the use of lower level (knowledge) questions is encouraging. However, such a conclusion needs clarification by attending to the various sub-test achievement results.

There were no significant differences between treatment conditions regarding the knowledge sub-test. This result seems only natural in that both high-level and low-level questions require pupils to deal with specific facts.

Regarding comprehension, both groups achieved equally as well. Several reasons can be offered to explain this similarity. Pupils in most instances have experienced situations demanding them to react to comprehension type questions. Perhaps this similarity of prior background accounts for the no significant differences. Another reason for the sameness of results could be because both groups did have in their conditions some comprehension questions.

The main effect of reading also may have served to equalize the two treatment conditions.

Application data favored pupils in Treatment A but failed to achieve the necessary significance level (.05). Perhaps more time was needed for dealing with such questions than was provided by the experiment. But, the time factor loses some of its validity in that boys did significantly better than girls in dealing with such questions. Perhaps the content interested boys more than girls.

Data also favored Treatment A regarding the analysis achievement sub-test, but again the necessary significant F value was not obtained. Interacting with analytical types of questions requires of pupils, it would seem, a certain sophistication in dealing with analytical thought patterns. It is quite plausible that pupils in Treatment A lacked prior school experiences that would foster analytic skill development. The experiment's time factor also could be deficient in length for dealing with such questions.

Questions demanding synthesis were dealt with equally well by pupils in the two treatment conditions. The reasons of insufficient time and lack of previous background with such questions may be applied here as well to explain the sameness of performance by pupils in the two treatments.

Encouragement for the use of high level questions is obtained from the fact that Treatment A pupils did significantly better than pupils in Treatment B with regard to the evaluation sub-test. This result has many ramifications for, according to the Taxonomy, evaluation subsumes the categories of synthesis, analysis, application, comprehension, and knowledge. If this is true then success in the evaluation category by pupils in Treatment A assumes that these pupils have obtained competence in the categories lower in the hierarchy. This result may somewhat alter the real meaning of the similarities of the two groups' performance in the other categories of the achievement test.

Regardless of treatment group, reading exerted a significant influence upon each one of the subdivisions of the achievement test. Better readers out-performed poorer readers. This result is not surprising. The materials involved and the format of the experiment demanded reading ability on the part of the subjects.

The intercorrelations of the Social Studies Inference Test factors seemed to attest to the validity of the test. The relationships that existed between the pre-test factors and the post-test factors of the Inference Test were of similar magnitude. The high correlations existed between the same elements regardless of whether one was dealing with data for Treatment A's or B's pupils. Again the short duration of the experiment may have been insufficient to alter the relationships among this test's variables.

The intercorrelations of the achievement test factors for Treatment A increased somewhat after the experimental period. This did not occur for the test factors in Treatment B. It is possible that high-level questions assisted pupils in relating the various aspects of achievement to a better degree than low-level questions. However, the small values of the correlations, even though significant, make drawing conclusions rather tenuous.

Implications

The study's implications deal specifically with the social studies but can, without losing validity, be applied to the curriculum in general. It is paramount that attention continue to be given to the influences of high-level questions upon pupils' thinking and achievement. This study is presented as a beginning, a stimulus for further research into the effects of various types of questions. Teachers need to realize that certain kinds of questions are capable of influencing pupils in predictable ways. Adding preciseness to this realization will enable teachers to relate their questions and questioning strategies more effectively to instructional goals and specific groups of pupils.

The exact role of the question is still imprecise with regard to critical thinking. One cannot state that high-level questions guarantee that high-level thinking will be stimulated in pupils. Further study is needed to provide insight. Nevertheless, one can conclude from this experiment that the high-level questions did not make the pupils think less than pupils receiving knowledge questions.

Implications can be drawn from the study regarding the role of questions in relation to social studies achievement in particular and overall school achievement in general with a little more certainty. First, if questions at higher cognitive levels are capable of stimulating high achievement, then teachers should be using such questions in greater quantity than is currently done. Better questions should make information more meaningful.

If teachers employ high level questions, then it should be expected that pupils will employ such questions also. Improved questioning skills on the parts of pupils can greatly assist pupils in not only class discussion but when engaged in independent study. The emphasis today on process learning seems to demand that pupils be effective questioners.

Implications are not just pertinent for teachers. Publishers of educational materials should be able to profit from these findings. Test makers also can glean implications from this study.

Administrators, supervisors, and curriculum coordinators also should see implications from this experiment's results. Supervisors should be concerned with the level of teachers' questions. Administrators and curriculum coordinators should strive to have included in curriculum guides and bulletins suggestive information on the nature of the question and on good questioning strategies.

The study has also demonstrated the merit of Bloom's Taxonomy as a tool capable of guiding question construction and of giving direction to various aims set by teachers.

Recommendations for Further Study

This study was a beginning; replication is most necessary. Various modifications can also prove productive. The time can be lengthened and the number of subjects increased. Different samples can be employed. Different contents can be employed.

Another possibility for additional study would involve training some teachers to form specific types of questions and examining the critical thinking and social studies achievement of their pupils. Certainly teachers must be involved in numerous experiments.

Pupils can be involved. Experiments can be constructed whereby pupils trained in the use of effective questions can be compared regarding thinking and achievement with pupils lacking such training.

The question is a significant variable in the teaching-learning process. Additional research must be forthcoming to add empirical substance to the exhortation that educators ask "good" questions.

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APPENDIX A

COVARIANCE AND CORRELATION TABLES

TABLE 7.--MEANS AND STANDARD DEVIATIONS FOR INFERENCE SCORES (PRE- AND POST-TEST)

Treatment group	Sex of pupils	Reading level															
		Quartile 1				Quartile 2				Quartile 3				Quartile 4			
		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
A	Boys	13.37	5.70	14.89	6.36	17.57	5.92	17.43	5.90	16.94	3.83	16.70	6.38	16.65	4.78	19.88	6.46
	Girls	12.20	7.54	15.00	5.37	14.87	4.46	16.50	6.61	15.42	5.65	14.42	6.21	16.23	6.05	16.14	6.98
B	Boys	14.71	4.67	15.00	5.11	15.82	3.88	17.36	3.67	18.20	4.44	21.60	3.07	18.33	3.16	18.33	4.92
	Girls	14.25	5.24	12.31	4.55	4.27	6.02	16.69	6.17	16.44	5.05	16.72	4.58	19.11	4.37	19.94	4.43

TABLE 8.--MEANS AND STANDARD DEVIATIONS FOR CAUTION SCORES (PRE- AND POST-TEST)

Treatment group	Sex of pupils	Reading level															
		Quartile 1				Quartile 2				Quartile 3				Quartile 4			
		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
A	Boys	18.31	7.07	17.35	7.90	15.28	5.17	15.78	6.45	15.65	4.85	16.70	7.42	16.94	5.46	14.12	6.78
	Girls	10.80	5.74	15.10	6.22	16.37	4.88	15.44	6.62	16.67	6.19	20.94	6.43	17.64	6.84	18.68	7.58
B	Boys	16.78	6.93	16.93	7.25	14.77	5.69	14.59	4.15	14.40	4.10	11.80	3.43	14.77	4.42	16.00	5.09
	Girls	15.69	6.63	17.94	4.68	16.81	7.50	15.92	7.28	15.00	6.58	15.00	6.50	14.44	4.47	13.67	4.36

TABLE 9.--MEANS AND STANDARD DEVIATIONS FOR OVER-GENERALIZATION SCORES (PRE- AND POST-TEST)

Treat- ment group	Sex of pupils	Reading level															
		Quartile 1				Quartile 2				Quartile 3				Quartile 4			
		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
A	Boys	5.16	2.91	6.47	2.72	6.43	2.99	7.35	3.13	5.59	2.43	5.29	3.46	4.76	1.88	6.65	2.61
	Girls	7.20	3.89	7.40	3.55	6.00	3.33	7.25	3.33	5.92	2.59	5.75	3.58	4.45	2.67	3.64	2.69
B	Boys	6.14	3.48	6.21	2.88	6.54	2.52	6.54	2.52	6.20	2.18	7.30	1.90	4.67	1.76	4.89	1.85
	Girls	6.31	2.89	5.92	2.22	7.15	2.67	6.58	2.87	6.50	3.43	7.28	3.16	5.61	2.45	5.28	1.66

TABLE 10.--MEANS AND STANDARD DEVIATIONS FOR DISCRIMINATION SCORES (PRE-AND POST-TEST)

Treat- ment group	Sex of pupils	Reading level															
		Quartile 1				Quartile 2				Quartile 3				Quartile 4			
		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
A	Boys	6.05	2.39	6.63	3.06	8.00	1.65	7.71	2.31	8.00	1.64	7.82	1.62	8.00	2.27	9.23	2.26
	Girls	4.80	2.23	7.30	2.10	7.56	1.54	7.56	2.64	7.50	1.71	8.16	2.44	9.00	2.31	9.18	2.96
B	Boys	7.57	2.53	7.57	2.23	7.77	1.16	7.77	2.09	6.90	1.22	9.00	1.55	8.78	1.55	9.44	1.49
	Girls	6.62	1.45	7.00	1.66	7.65	2.09	7.54	1.31	8.33	2.05	8.67	2.38	8.78	2.25	9.33	2.00

TABLE 11.--SUMMARY OF ANALYSIS OF COVARIANCE OF POST-TEST SCORES ON INFERENCE SUB-TEST OF SOCIAL STUDIES INFERENCE TEST

Source of Variation	Original		Adjusted			
	d.f.	S.S.	d.f.	S.S.	M.S.	F
Treatment	1	.55	1	.41	.41	.17
Reading level	3	41.25	3	9.44	3.14	1.35
Sex	1	5.14	1	.96	.96	.41
Treatment x reading level	3	20.08	3	15.62	5.21	2.24
Treatment x sex	1	1.10	1	4.11	4.11	1.76
Reading level x sex	3	11.55	3	14.15	4.71	2.02
Treatment x reading level x sex	3	16.28	3	10.51	3.50	1.50
Within groups	244	696.12	243	565.04	2.33	

All F ratios are non-significant (p= .05).
S. S. represents sums of squares.
M. S. represents mean squares.
d.f. represents degrees of freedom.

TABLE 12.--ADJUSTED MEANS FOR POST-TEST INFERENCE SCORES

Treatment group	Sex of pupils	Reading levels			
		Q_1	Q_2	Q_3	Q_4
A	Boys	16.30	16.49	16.12	19.45
	Girls	17.07	17.07	14.68	16.33
B.	Boys	15.66	17.40	20.31	16.96
	Girls	13.23	17.60	16.41	18.14

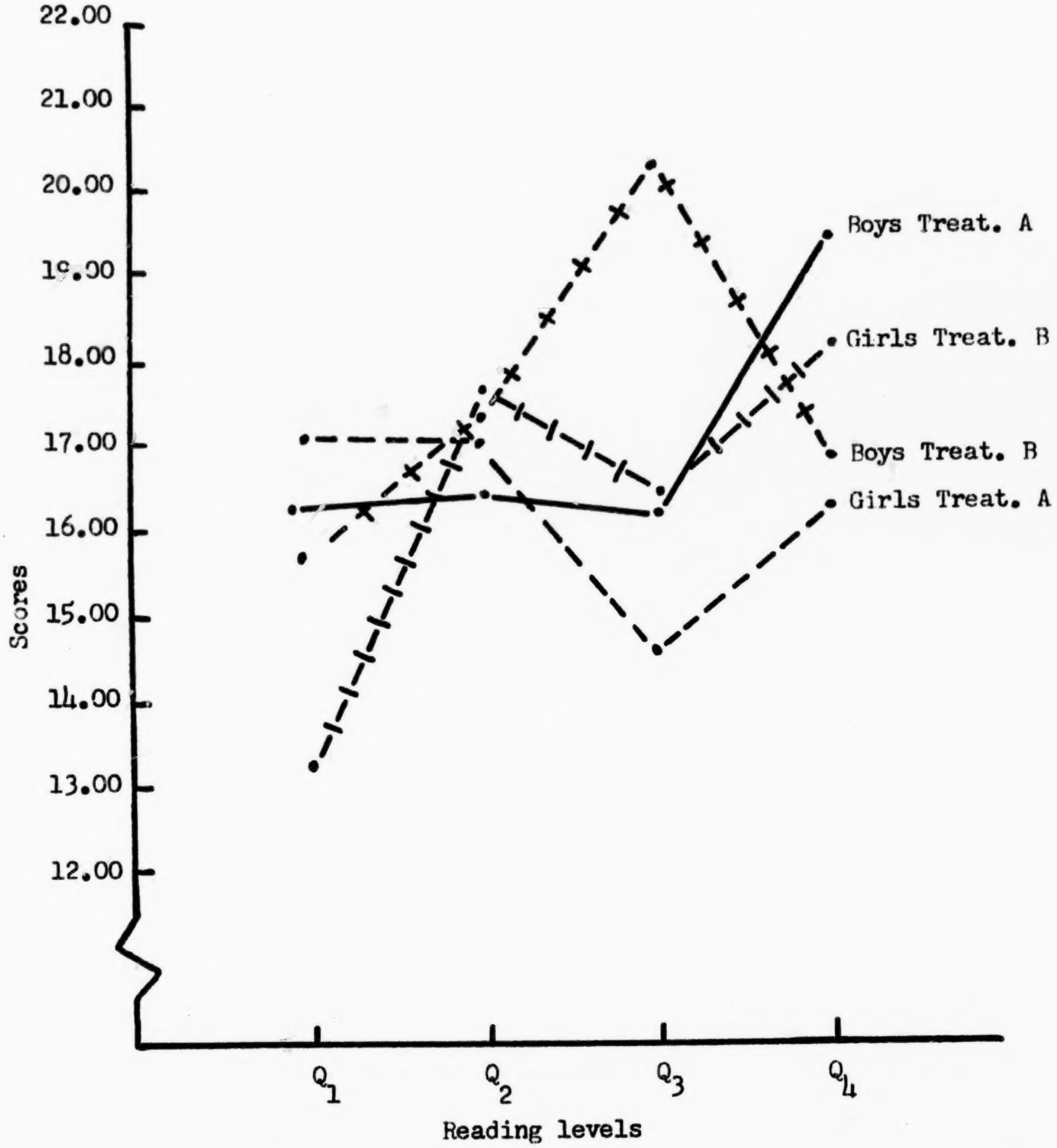

Figure I. --Adjusted means for post-test inference scores.

TABLE 13.--SUMMARY OF ANALYSIS OF COVARIANCE OF POST-TEST SCORES IN CAUTION SUB-TEST OF SOCIAL STUDIES INFERENCE TEST

Source of Variation	Original		Adjusted			
	d.f.	S.S.	d.f.	S.S.	M.S.	F
Treatment	1	9.30	1	5.40	5.40	4.35*
Reading level	3	4.60	3	6.93	2.31	1.86
Sex	1	5.45	1	8.20	8.20	6.61*
Treatment x reading level	3	23.97	3	16.40	5.46	4.40**
Treatment x sex	1	.56	1	.03	.03	.02
Reading level x sex	3	10.02	3	7.04	2.34	1.89
Treatment x reading level x sex	3	14.92	3	8.06	2.68	2.16
Within groups	244	495.12	243	303.18	1.24	

**Significant at the .01 level.
*Significant at the .05 level.

TABLE 14.--ADJUSTED MEANS FOR POST-TEST CAUTION SCORES

Treatment group	Sex of pupils	Reading level Q_1	Q_2	Q_3	Q_4
A	Boys	15.89	16.08	16.79	13.46
	Girls	18.00	15.11	20.42	17.61
B	Boys	16.36	15.19	12.61	16.60
	Girls	18.00	15.34	15.46	14.46

TABLE 15.--ADJUSTED MEANS OF POST-TEST CAUTION SCORES OF PUPILS IN TWO TREATMENTS AND FOUR READING LEVELS

Treatment Group	Reading levels Q_1	Q_2	Q_3	Q_4
A	16.60	15.65	18.29	15.76
B	17.23	15.27	14.44	15.16

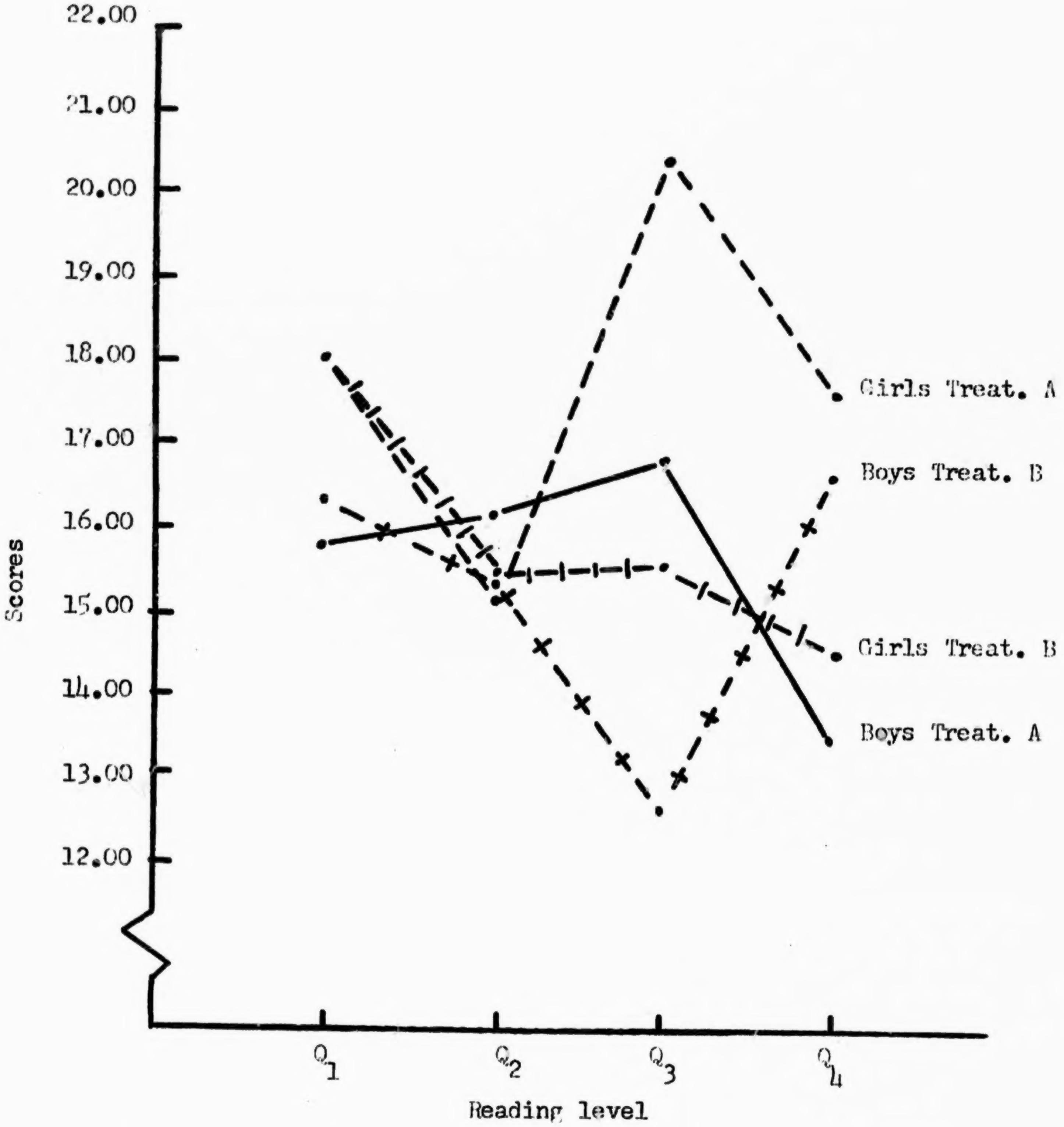

Figure II. -- Adjusted means for post-test caution scores.

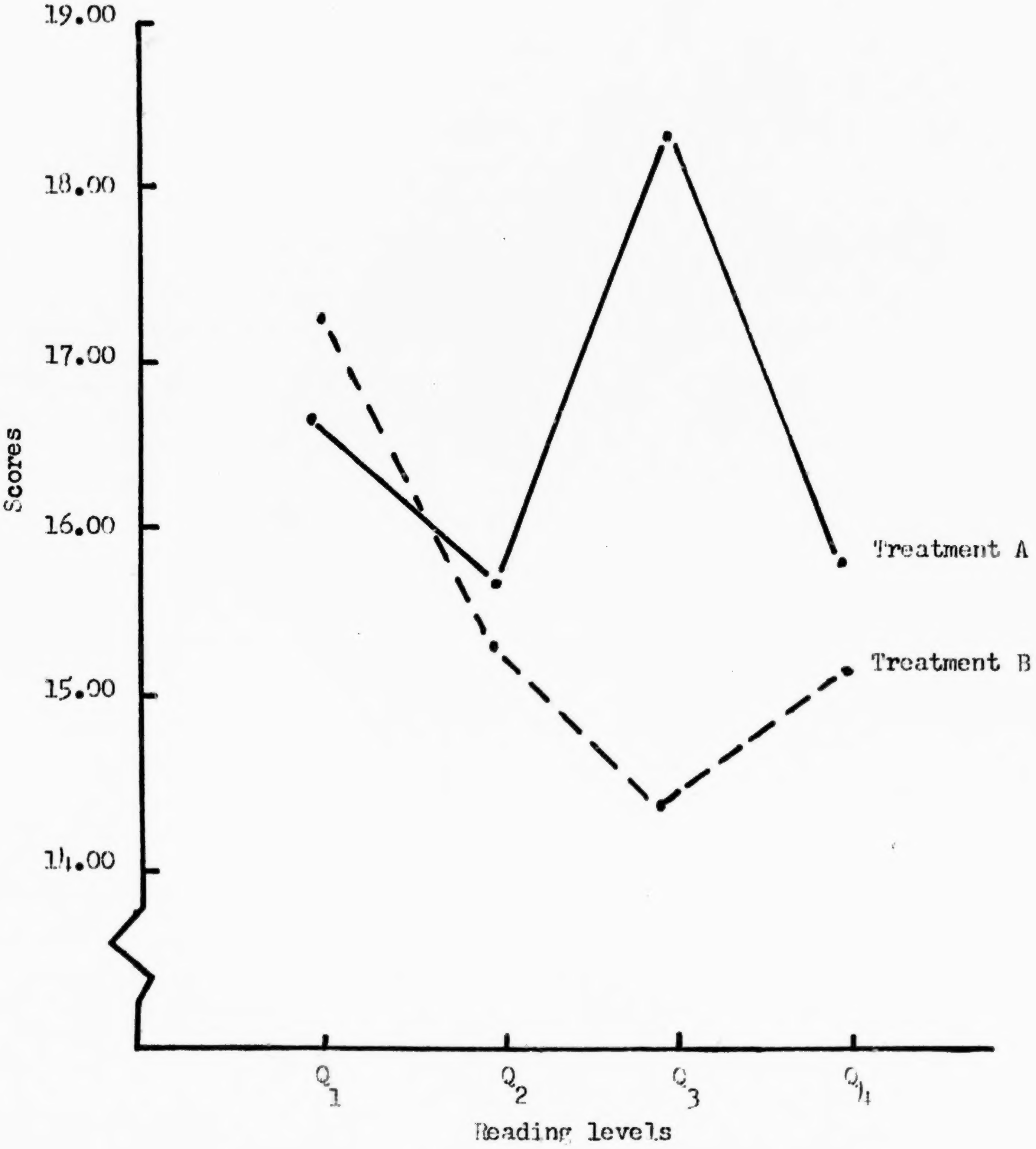

Figure III. -- Adjusted means for interaction between treatments and reading levels for caution scores.

TABLE 16.--SUMMARY OF ANALYSIS OF COVARIANCE OF POST-TEST SCORES ON OVER-GENERALIZATION SUB-TEST OF SOCIAL STUDIES INFERENCE TEST

Source of Variation	Original		Adjusted			
	d.f.	S.S.	d.f.	S.S.	M.S.	F
Treatment	1	.01	1	.19	.19	.54
Reading level	3	7.43	3	1.71	.57	1.62
Sex	1	.17	1	.82	.82	2.34
Treatment x reading level	3	4.41	3	3.95	1.31	3.74*
Treatment x sex	1	.20	1	.15	.15	.42
Reading level x sex	3	1.70	3	1.46	.48	1.37
Treatment x reading level x sex	3	3.12	3	1.76	.59	1.68
Within groups	244	124.02	243	86.64	.35	

* Significant at the .05 level.

TABLE 17.--ADJUSTED MEANS FOR POST-TEST OVER-GENERALIZATION SCORES

Treatment group	Sex of pupils	Reading levels			
		Q_1	Q_2	Q_3	Q_4
A	Boys	6.87	7.05	5.46	7.27
	Girls	6.68	7.15	5.73	4.43
B	Boys	6.07	6.18	7.13	5.56
	Girls	5.71	5.89	6.94	5.43

TABLE 18.--ADJUSTED MEANS FOR OVER-GENERALIZATION SCORES BETWEEN TREATMENTS AND READING LEVELS

Treatment groups	Reading levels			
	Q_1	Q_2	Q_3	Q_4
A	6.81	7.14	5.57	5.71
B	5.87	7.10	6.93	5.47

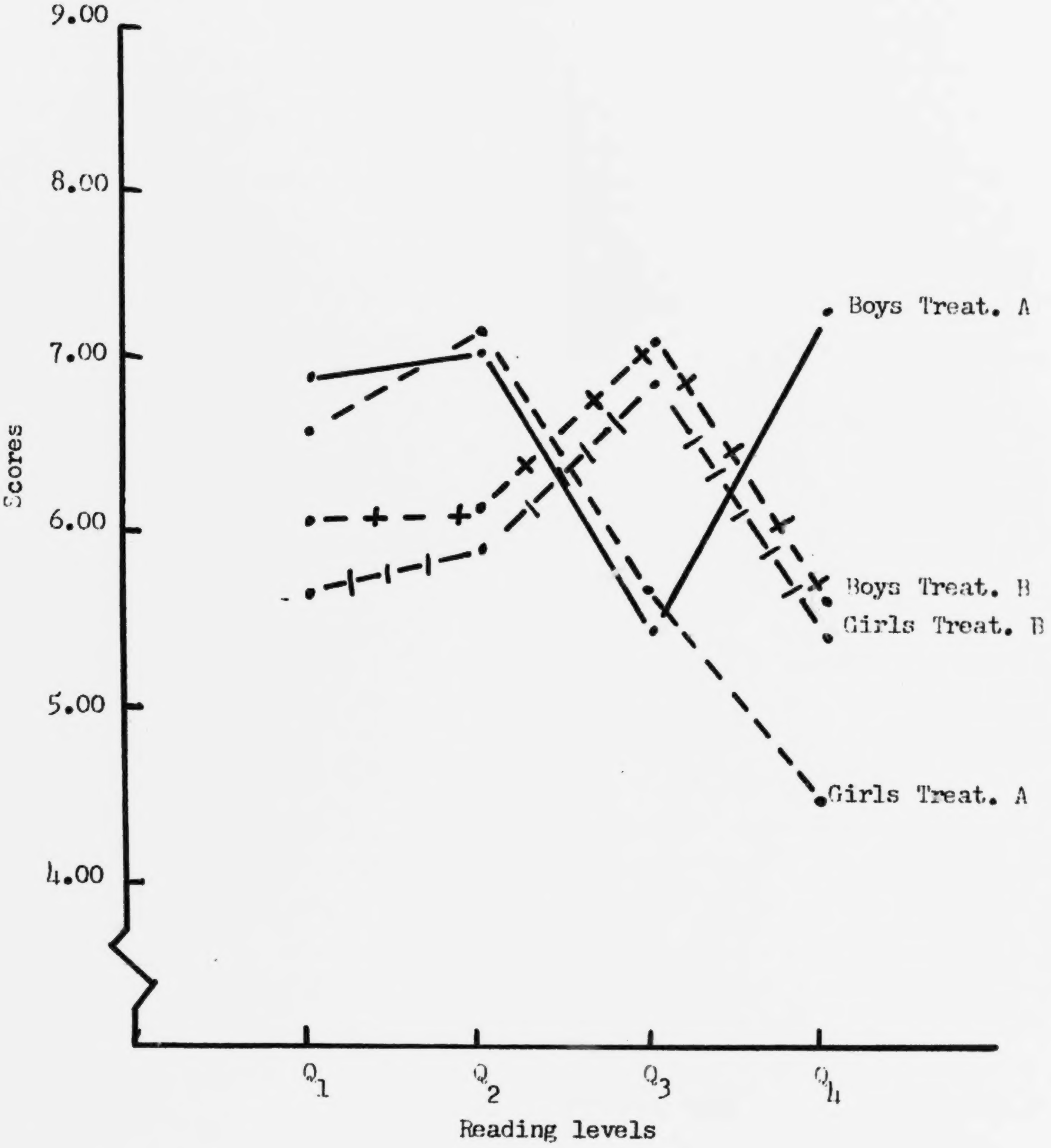

Figure IV. -- Adjusted means for post-test over-generalization scores.

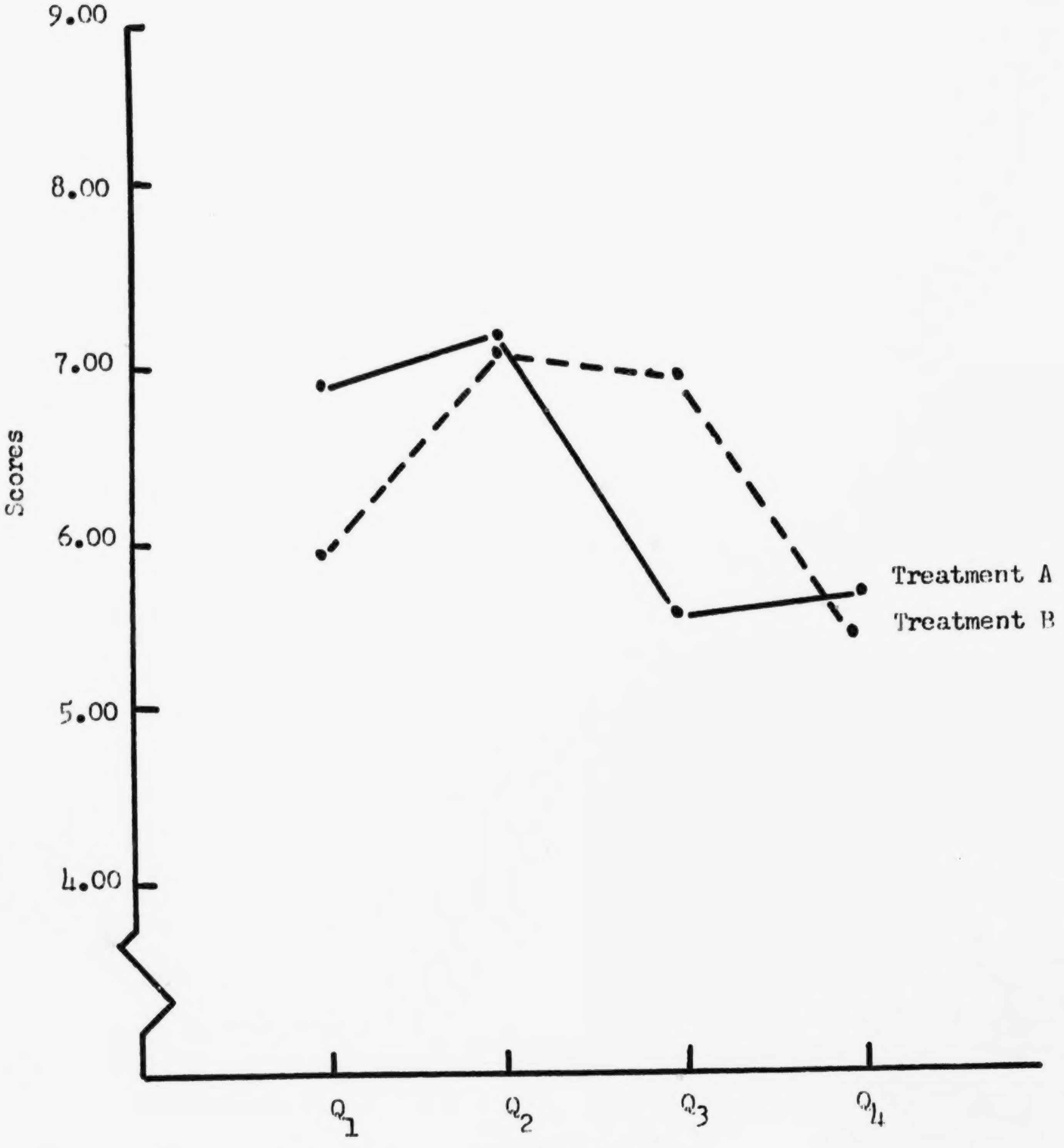

Figure V. -- Adjusted means for interaction between treatments and reading levels for post-test overgeneralization scores.

TABLE 19.--SUMMARY OF ANALYSIS OF COVARIANCE OF POST-TEST SCORES ON DISCRIMINATION SUB-TEST

Source of Variation	Original		Adjusted			
	d.f.	S.S.	d.f.	S.S.	M.S.	F
Treatment	1	.46	1	.06	.06	.33
Reading level	3	10.73	3	4.18	1.39	7.72**
Sex	1	.06	1	.00	.00	.00
Treatment x reading level	3	.38	3	.74	.25	1.38
Treatment x sex	1	.27	1	.41	.41	2.27
Reading level x sex	3	.04	3	.30	.10	.55
Treatment x reading level x sex	3	.23	3	.50	.16	.88
Within groups	244	53.16	243	44.04	.18	

** Significant at the .01 level.

TABLE 20. -- ADJUSTED MEANS FOR POST-TEST DISCRIMINATION SCORES

Treatment group	Sex of pupils	Reading levels			
		Q_1	Q_2	Q_3	Q_4
A	Boys	7.25	7.57	7.68	9.09
	Girls	8.40	7.59	8.21	8.65
B	Boys	7.59	7.72	9.28	9.89
	Girls	7.39	7.53	8.40	8.88

TABLE 21.--ADJUSTED MEANS OF DISCRIMINATION SCORES BY READING LEVELS

Reading levels			
Q_1	Q_2	Q_3	Q_4
7.56	7.60	8.29	8.87

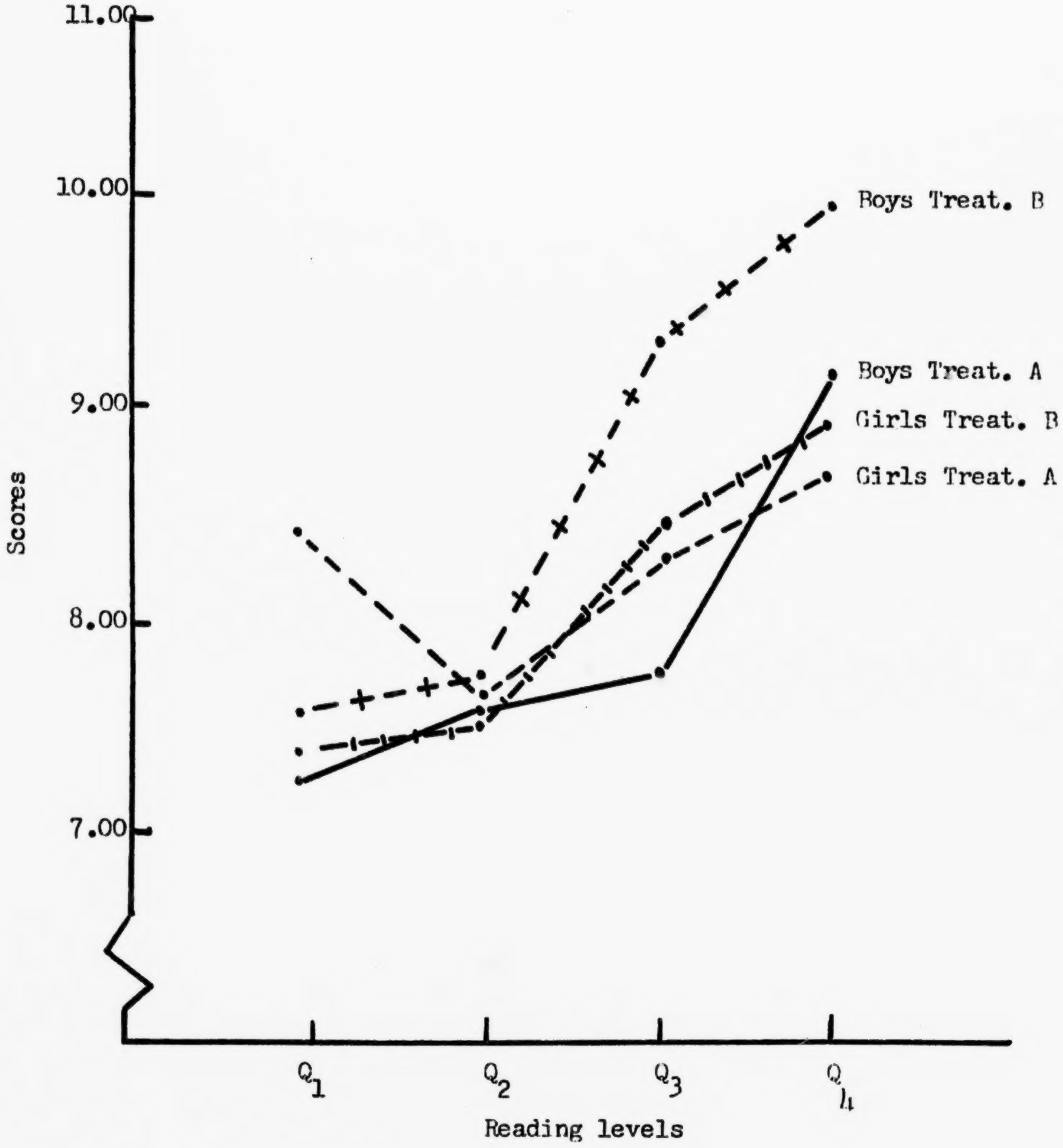

Figure VI. -- Adjusted means for post-test discrimination scores.

TABLE 22.--MEANS AND STANDARD DEVIATIONS FOR ACHIEVEMENT TEST SCORES (PRE- AND POST-TEST TOTAL)

Treatment group	Sex of pupils	Reading level															
		Quartile 1				Quartile 2				Quartile 3				Quartile 4			
		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
A	Boys	13.84	2.48	16.84	5.52	15.57	3.85	20.21	4.43	16.41	4.24	21.35	3.39	19.59	4.35	23.82	5.68
	Girls	12.40	3.10	15.70	2.49	15.69	3.23	17.25	4.16	16.00	3.39	20.17	3.95	19.23	4.58	25.45	4.01
B	Boys	14.36	2.84	16.07	3.59	14.00	4.77	16.09	3.89	15.20	2.92	18.50	3.04	17.78	3.29	22.89	4.93
	Girls	13.12	3.98	14.00	4.21	15.08	4.07	18.04	3.12	16.05	3.45	19.39	3.33	19.33	4.74	21.94	5.04

TABLE 23.--SUMMARY OF ANALYSIS OF COVARIANCE OF POST-TEST SCORES ON ACHIEVEMENT TEST

Source of Variation	Original		Adjusted			
	d.f.	S.S.	d.f.	S.S.	M.S.	F
Treatment	1	12.06	1	10.05	10.05	9.85**
Reading level	3	133.55	3	65.02	21.67	21.24**
Sex	1	.92	1	.92	.92	.90
Treatment x reading level	3	.49	3	.23	.07	.06
Treatment x sex	1	.75	1	.26	.26	.25
Reading level x sex	3	2.29	3	.63	.21	.20
Treatment x reading level x sex	3	8.06	3	7.21	2.40	2.35
Within groups	244	269.88	243	247.98	1.02	

** Significant at the .01 level.

TABLE 24.--ADJUSTED MEANS FOR POST-TEST ACHIEVEMENT SCORES

Treatment group	Sex of pupils	Reading levels			
		Q_1	Q_2	Q_3	Q_4
A	Boys	17.48	20.32	21.19	22.68
	Girls	16.79	17.32	20.14	24.43
B	Boys	16.55	16.68	18.72	22.31
	Girls	14.86	18.30	19.35	20.88

TABLE 25.--ADJUSTED MEANS FOR ACHIEVEMENT SCORES BY READING LEVELS

Reading levels			
Q_1	Q_2	Q_3	Q_4
16.42	18.01	19.95	22.73

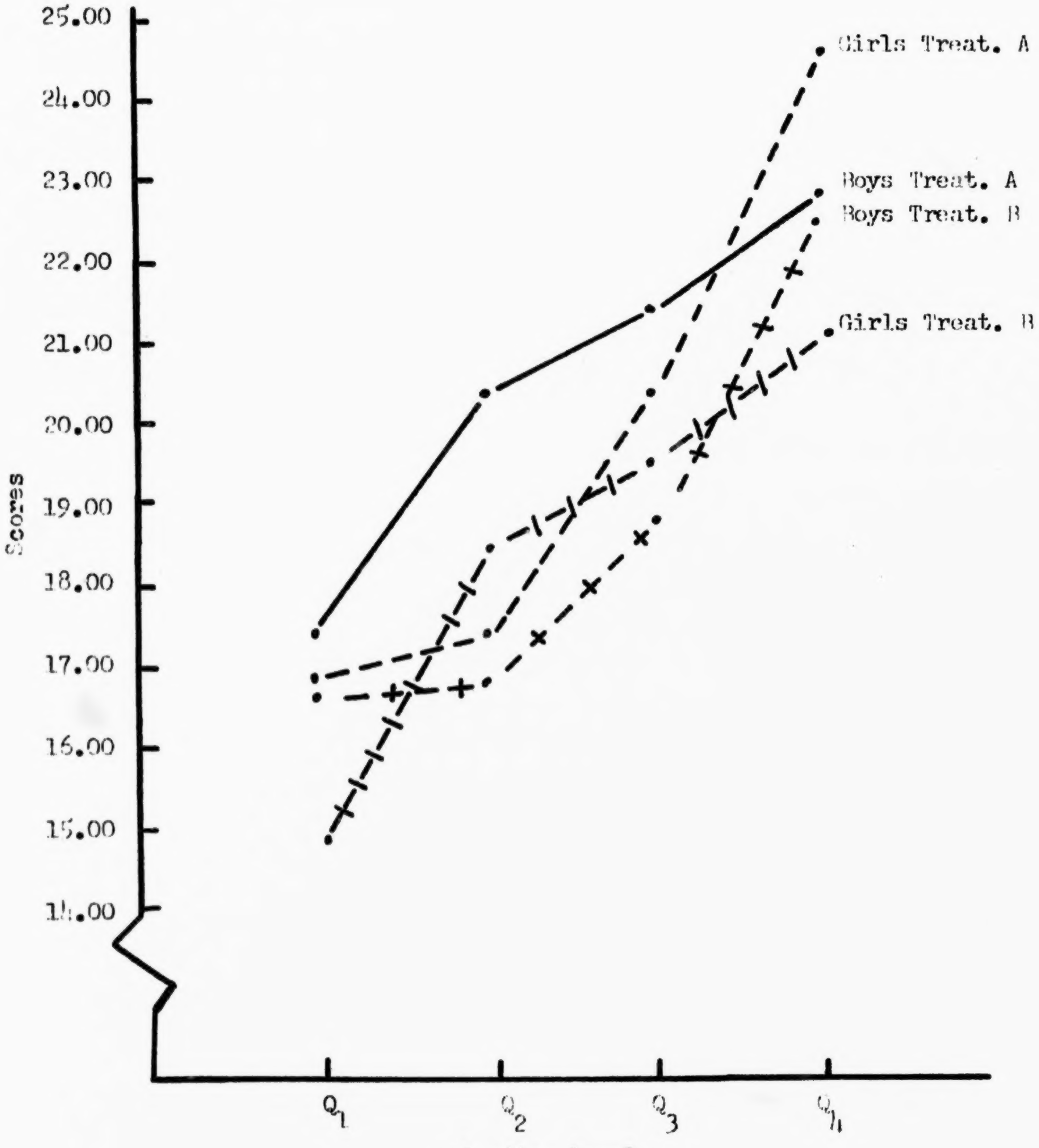

Figure VII. -- Adjusted means for post-test total achievement scores.

TABLE 26.--MEANS AND STANDARD DEVIATIONS FOR KNOWLEDGE SUB-TEST (PRE- AND POST-TEST TOTAL)

Treat-ment group	Sex of pupils	Reading level															
		Quartile 1				Quartile 2				Quartile 3				Quartile 4			
		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
A	Boys	1.79	1.10	2.58	1.18	2.57	.98	2.79	1.01	2.18	1.19	3.24	1.06	2.59	1.09	4.00	1.19
	Girls	2.00	1.00	2.50	1.50	2.31	1.16	2.81	1.24	2.50	.90	3.00	1.35	2.68	1.14	3.41	1.07
B	Boys	2.93	.96	2.36	1.44	2.00	1.04	3.18	1.85	2.30	.64	2.80	.87	2.33	1.05	3.67	1.49
	Girls	2.06	1.48	2.63	1.27	2.19	1.30	2.85	1.38	2.06	.91	2.94	1.18	2.50	1.17	3.67	1.15

TABLE 27.--MEANS AND STANDARD DEVIATIONS FOR COMPREHENSION SUB-TEST (PRE- AND POST-TEST TOTAL)

Treat-ment group	Sex of pupils	Reading level															
		Quartile 1				Quartile 2				Quartile 3				Quartile 4			
		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
A	Boys	2.32	1.29	2.89	1.12	2.57	1.05	2.43	1.29	2.29	.82	3.06	.94	2.65	1.03	3.00	1.24
	Girls	2.50	1.02	2.70	1.00	2.25	1.56	2.50	1.27	2.50	1.12	2.50	1.32	2.55	1.23	3.77	1.17
B	Boys	2.07	.80	2.79	1.26	2.05	1.55	2.27	1.35	2.10	.83	3.10	1.22	2.22	.79	3.56	1.07
	Girls	1.69	1.10	2.06	1.03	2.12	1.31	3.08	1.27	2.67	.94	2.78	1.23	2.39	1.21	2.94	1.58

TABLE 28.--MEANS AND STANDARD DEVIATIONS FOR APPLICATION SUB-TEST (PRE- AND POST-TEST TOTAL)

Treat-ment group	Sex of pupils	Reading level															
		Quartile 1				Quartile 2				Quartile 3				Quartile 4			
		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
A	Boys	2.79	1.58	2.89	1.55	3.07	1.39	4.14	1.12	3.35	1.23	4.00	.97	4.35	1.49	5.35	1.23
	Girls	2.20	.75	3.00	.89	2.69	1.45	3.00	1.46	3.67	1.03	3.83	1.14	4.05	1.36	4.59	1.03
B	Boys	2.21	1.47	2.86	1.36	2.68	1.18	3.32	1.46	3.00	1.18	3.80	1.25	3.78	1.23	4.44	1.07
	Girls	2.19	1.38	2.31	1.04	2.65	1.41	3.12	1.15	3.11	1.37	3.72	1.52	3.83	1.64	4.22	1.44

TABLE 29.--MEANS AND STANDARD DEVIATIONS FOR ANALYSIS SUB-TEST (PRE- AND POST-TEST TOTAL)

Treat-ment group	Sex of pupils	Reading level															
		Quartile 1				Quartile 2				Quartile 3				Quartile 4			
		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
A	Boys	1.84	.93	2.37	1.34	2.00	1.25	3.00	1.56	3.12	1.60	3.65	1.13	3.59	1.33	4.18	1.34
	Girls	1.40	1.02	2.10	.83	2.19	1.13	3.00	1.41	2.67	1.25	3.33	1.25	3.68	1.33	4.86	1.22
B	Boys	2.14	1.46	2.91	.88	2.23	1.47	2.14	1.18	2.60	1.20	2.70	1.10	3.33	1.25	4.44	1.06
	Girls	1.94	1.25	2.44	.93	2.50	1.28	2.65	1.11	2.78	1.40	3.50	9.57	3.89	1.52	3.78	1.43

TABLE 30.--MEANS AND STANDARD DEVIATIONS FOR SYNTHESIS SUB-TEST (PRE- AND POST-TEST TOTAL)

Treat-ment group	Sex of pupils	Reading level															
		Quartile 1				Quartile 2				Quartile 3				Quartile 4			
		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
A	Boys	2.63	1.42	2.89	1.94	2.57	1.45	4.07	1.44	2.76	1.21	3.82	1.15	3.33	1.58	3.53	1.24
	Girls	2.50	1.56	2.60	1.28	2.87	1.36	3.31	1.48	3.00	1.22	3.92	1.32	3.50	1.08	5.00	1.21
B	Boys	2.36	1.04	2.86	.99	2.59	1.47	2.91	1.20	2.61	.92	3.80	1.07	3.11	1.37	3.55	1.42
	Girls	2.56	1.22	2.75	1.56	2.88	1.15	3.38	1.33	3.11	1.45	3.88	1.10	3.22	1.43	3.66	1.56

TABLE 31.--MEANS AND STANDARD DEVIATIONS FOR EVALUATION SUB-TEST (PRE- AND POST-TEST TOTAL)

Treat-ment group	Sex of pupils	Reading level															
		Quartile 1				Quartile 2				Quartile 3				Quartile 4			
		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
A	Boys	2.58	1.18	3.21	1.54	2.71	.79	3.78	1.26	2.70	1.64	3.59	1.19	2.82	.74	3.76	1.35
	Girls	1.80	1.25	2.80	1.17	3.44	1.27	2.62	1.05	2.67	1.10	3.58	1.11	3.12	1.14	3.82	1.27
B	Boys	2.62	1.34	2.28	1.10	2.50	1.23	2.27	1.13	2.60	.92	2.30	1.10	3.00	1.49	3.22	1.47
	Girls	2.56	7.88	1.81	1.23	2.69	1.38	2.92	1.21	2.33	.88	2.55	1.12	3.50	8.97	3.61	1.11

TABLE 32.--SUMMARY OF ANALYSIS OF COVARIANCE OF POST-TEST SCORES IN KNOWLEDGE SUB-TEST OF SOCIAL STUDIES ACHIEVEMENT TEST

Source of Variation	Original		Adjusted			
	d.f.	S.S.	d.f.	S.S.	M.S.	F
Treatment	1	.00	1	.00	.00	.00
Reading level	3	2.84	3	2.65	.88	8.80**
Sex	1	.04	1	.04	.04	.40
Treatment x reading level	3	.11	3	.17	.05	.50
Treatment x sex	1	.06	1	.07	.07	.70
Reading level x sex	3	.09	3	.11	.03	.30
Treatment x reading level x sex	3	.13	3	.16	.05	.50
Within groups	244	26.07	243	25.89	.10	

** Significant at the .01 level.

TABLE 33.—ADJUSTED MEANS FOR POST-TEST KNOWLEDGE SUB-TEST SCORES

Treatment group	Sex of pupils	Reading levels			
		Q_1	Q_2	Q_3	Q_4
A	Boys	2.62	2.69	3.25	3.98
	Girls	2.52	2.81	2.99	3.38
B	Boys	2.31	3.16	2.80	3.67
	Girls	2.65	2.86	2.96	3.66

TABLE 34.—ADJUSTED MEANS OF KNOWLEDGE SUB-TEST SCORES BY READING LEVELS

Reading levels			
Q_1	Q_2	Q_3	Q_4
2.53	2.92	3.02	3.68

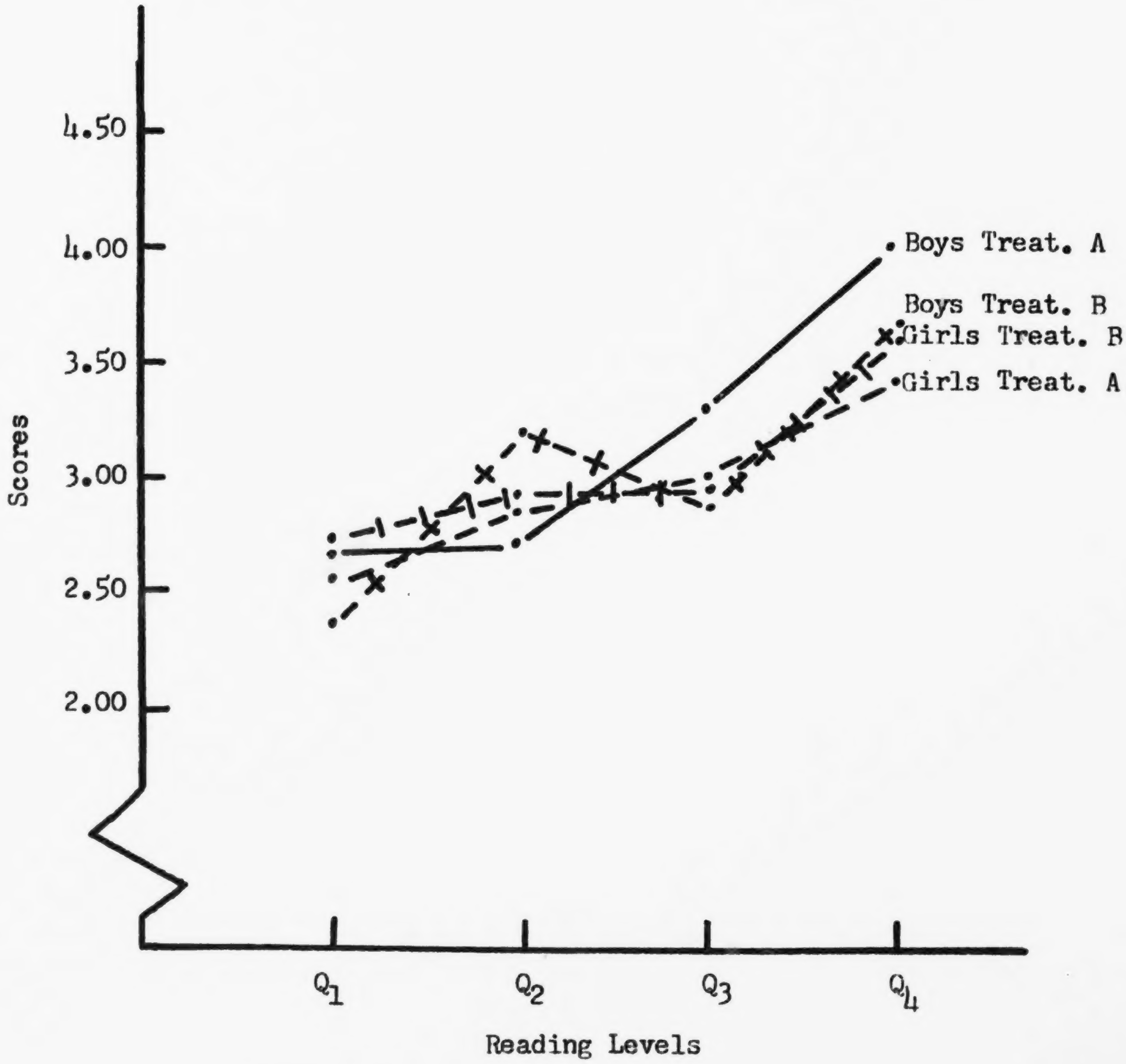

Figure VIII. -- Adjusted means for post-test knowledge achievement scores.

TABLE 35.--SUMMARY OF ANALYSIS OF COVARIANCE OF POST-TEST SCORES IN COMPREHENSION SUB-TEST OF SOCIAL STUDIES ACHIEVEMENT TEST

Source of Variation	Original		Adjusted			
	d.f.	S.S.	d.f.	S.S.	M.S.	F
Treatment	1	.00	1	.01	.01	.11
Reading level	3	1.42	3	1.14	.38	4.22**
Sex	1	.04	1	.06	.06	.66
Treatment x reading level	3	.22	3	.16	.05	.55
Treatment x sex	1	.06	1	.08	.08	.88
Reading level x sex	3	.56	3	.67	.22	2.44
Treatment x reading level x sex	3	.66	3	.62	.20	2.22
Within groups	244	23.63	243	21.93	.09	

** Significant at the .01 level.

TABLE 36.--ADJUSTED MEANS FOR POST-TEST COMPREHENSION SUB-TEST SCORES

Treatment group	Sex of pupils	Reading levels			
		Q_1	Q_2	Q_3	Q_4
A	Boys	2.88	2.29	3.07	2.82
	Girls	2.59	2.53	2.40	3.64
B	Boys	2.91	2.40	3.20	3.60
	Girls	2.37	3.17	2.55	2.89

TABLE 37.--ADJUSTED MEANS OF COMPREHENSION SUB-TEST SCORES BY READING LEVELS

Reading levels			
Q_1	Q_2	Q_3	Q_4
2.71	2.66	2.79	3.21

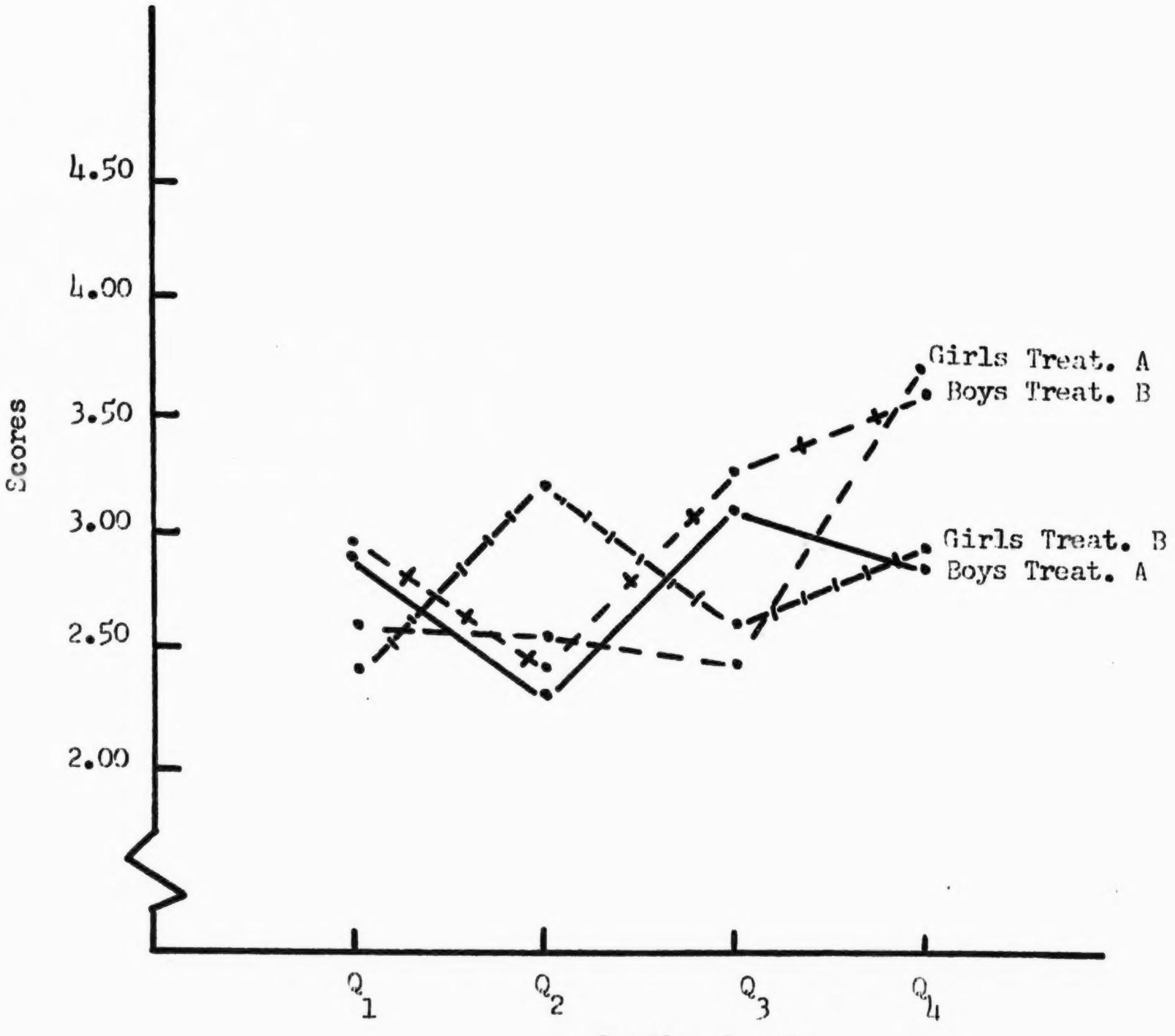

Figure IX. -- Adjusted means for post-test comprehension achievement scores.

TABLE 38.--SUMMARY OF ANALYSIS OF COVARIANCE OF POST-TEST SCORES IN APPLICATION SUB-TEST OF SOCIAL STUDIES ACHIEVEMENT TEST

Source of Variation	Original		Adjusted			
	d.f.	S.S.	d.f.	S.S.	M.S.	F
Treatment	1	.57	1	.29	.29	3.62
Reading level	3	7.54	3	3.12	1.04	13.00**
Sex	1	.57	1	.47	.47	5.87*
Treatment x reading level	3	.11	3	.12	.04	.50
Treatment x sex	1	.05	1	.03	.03	.37
Reading level x sex	3	.18	3	.15	.05	.63
Treatment x reading level x sex	3	.36	3	.40	.13	1.62
Within groups	244	24.93	243	21.76	.08	

* Significant at the .05 level.
** Significant at the .01 level.

TABLE 39.--ADJUSTED MEANS FOR POST-TEST APPLICATION SUB-TEST SCORES

Treatment group	Sex of pupils	Reading levels			
		Q_1	Q_2	Q_3	Q_4
A	Boys	3.00	4.15	3.91	4.92
	Girls	3.31	3.14	3.64	4.27
B	Boys	3.16	3.46	3.83	4.21
	Girls	2.62	3.27	3.72	3.97

TABLE 40.--ADJUSTED MEANS OF APPLICATION SUB-TEST SCORES BY READING LEVELS

Reading levels			
Q_1	Q_2	Q_3	Q_4
2.99	3.45	3.78	4.31

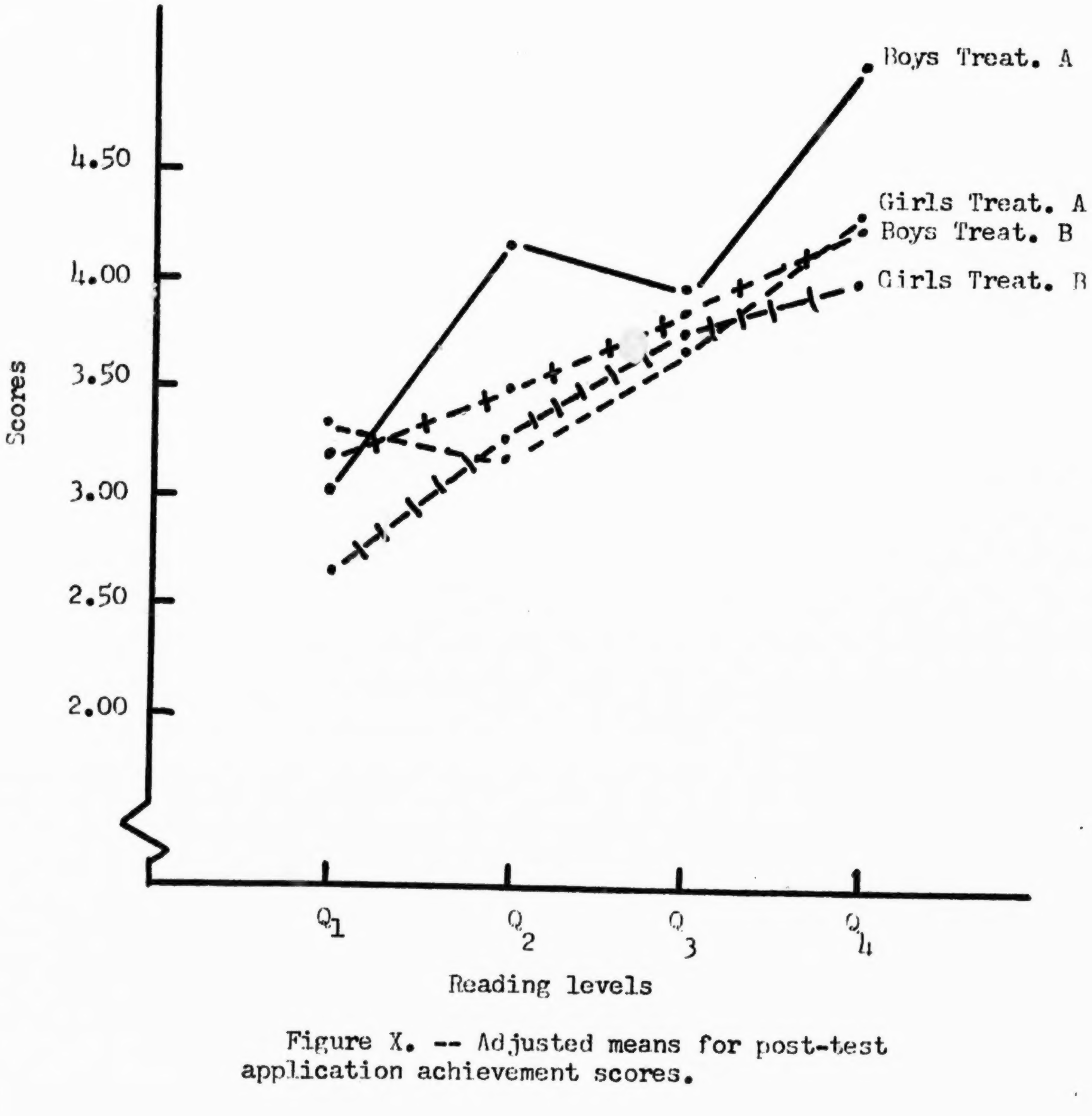

Figure X. -- Adjusted means for post-test application achievement scores.

TABLE 41.--SUMMARY OF ANALYSIS OF COVARIANCE OF POST-TEST SCORES IN ANALYSIS SUB-TEST OF SOCIAL STUDIES ACHIEVEMENT TEST

Source of Variation	Original		Adjusted			
	d.f.	S.S.	d.f.	S.S.	M.S.	F
Treatment	1	.23	1	.30	.30	3.75
Reading level	3	8.21	3	3.45	1.15	14.37**
Sex	1	.01	1	.01	.01	.12
Treatment x reading level	3	.66	3	.60	.20	2.50
Treatment x sex	1	.00	1	.02	.02	.25
Reading level x sex	3	.26	3	.21	.07	.87
Treatment x reading level x sex	3	.84	3	.84	.28	3.50*
Within groups	244	22.45	243	20.11	.08	

** Significant at the .01 level.

* Significant at the .05 level.

TABLE 42.--ADJUSTED MEANS FOR POST-TEST ANALYSIS SUB-TEST SCORES

Treatment group	Sex of pupils	Reading levels			
		Q_1	Q_2	Q_3	Q_4
A	Boys	2.60	3.19	3.51	3.91
	Girls	2.46	3.13	3.32	4.56
B	Boys	3.08	2.26	2.71	4.25
	Girls	2.65	2.69	3.46	3.42

TABLE 43.--ADJUSTED MEANS OF ANALYSIS SUB-TEST SCORES BY READING LEVELS

Reading levels			
Q_1	Q_2	Q_3	Q_4
2.70	2.75	3.31	4.04

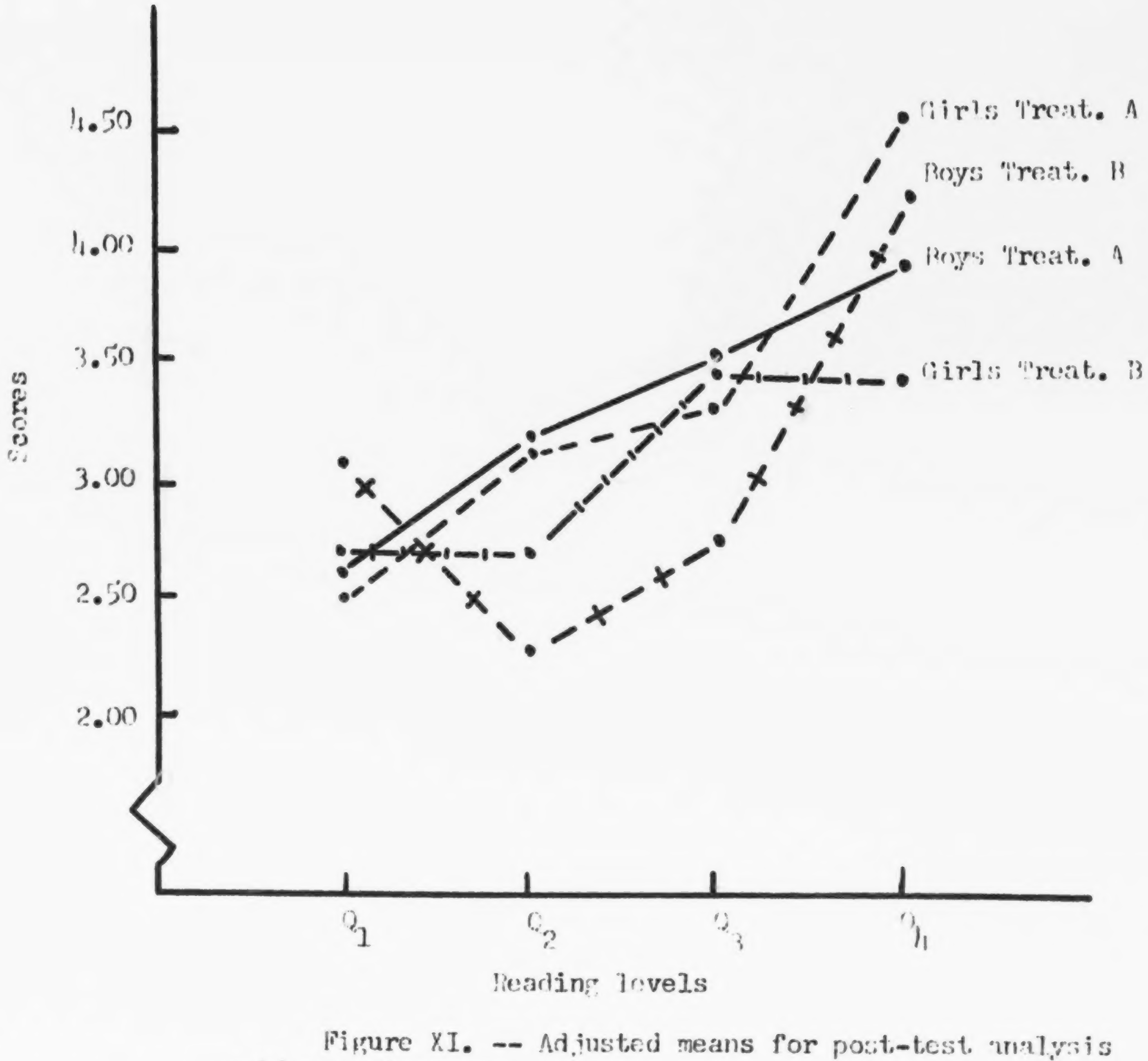

Figure XI. -- Adjusted means for post-test analysis achievement scores.

TABLE 44.—SUMMARY OF ANALYSIS OF COVARIANCE OF POST-TEST SCORES IN SYNTHESIS SUB-TEST OF SOCIAL STUDIES ACHIEVEMENT TEST

Source of Variation	Original		Adjusted			
	d.f.	S.S.	d.f.	S.S.	M.S.	F
Treatment	1	.34	1	.26	.26	2.60
Reading level	3	3.39	3	2.21	.73	7.30**
Sex	1	.07	1	.03	.03	.30
Treatment x reading level	3	.39	3	.36	.12	1.20
Treatment x sex	1	.00	1	.01	.01	.10
Reading level x sex	3	.62	3	.70	.23	2.30
Treatment x reading level x sex	3	.86	3	.89	.29	2.90*
Within groups	244	28.83	243	25.72	.10	

**Significant at the .01 level.

*Significant at the .05 level.

TABLE 45.--ADJUSTED MEANS FOR POST-TEST SYNTHESIS SUB-TEST SCORES

Treatment group	Sex of Pupils	Reading levels			
		Q_1	Q_2	Q_3	Q_4
A	Boys	2.98	4.18	3.86	3.31
	Girls	2.72	3.31	3.88	4.79
B	Boys	3.04	3.01	3.90	3.47
	Girls	2.86	3.38	3.80	3.54

TABLE 46.--ADJUSTED MEANS OF SYNTHESIS SUB-TEST SCORES BY READING LEVELS

Reading levels			
Q_1	Q_2	Q_3	Q_4
2.91	3.40	3.85	3.89

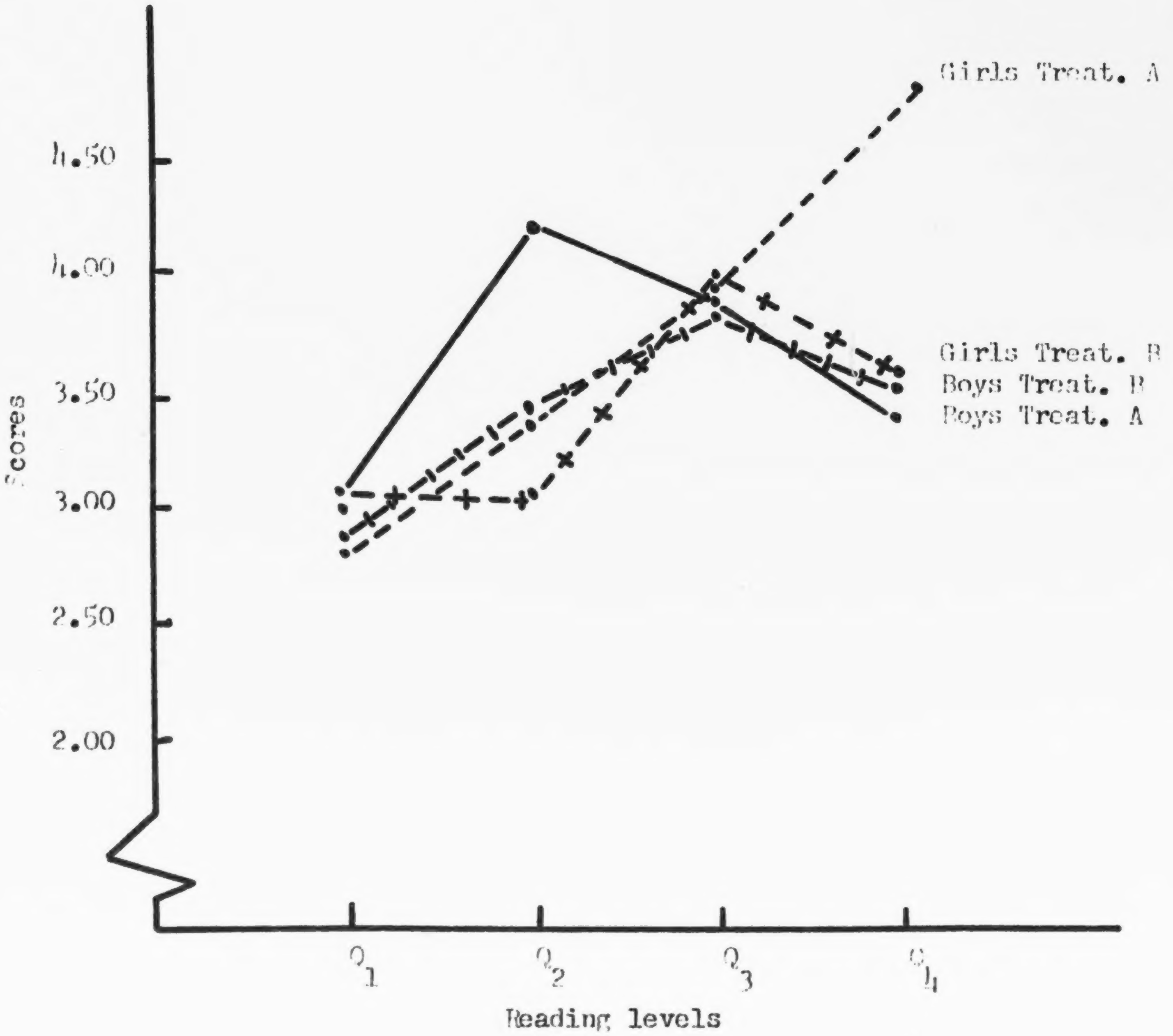

Figure XII. -- Adjusted means for post-test synthesis achievement scores.

TABLE 47.—SUMMARY OF ANALYSIS OF COVARIANCE OF POST-TEST SCORES IN EVALUATION SUB-TEST OF SOCIAL STUDIES ACHIEVEMENT TEST

Source of Variation	Original d.f.	Original S.S.	Adjusted d.f.	Adjusted S.S.	Adjusted M.S.	Adjusted F
Treatment	1	2.40	1	2.40	2.40	26.66**
Reading level	3	2.39	3	1.87	.62	6.88**
Sex	1	.03	1	.04	.04	.44
Treatment x reading level	3	.38	3	.39	.13	1.44
Treatment x sex	1	.34	1	.34	.34	3.77
Reading level x sex	3	.30	3	.26	.08	.88
Treatment x reading level x sex	3	.53	3	.61	.20	2.22
Within groups	244	23.28	243	22.77	.09	

**Significant at the .01 level.

TABLE 48.--ADJUSTED MEANS FOR POST-TEST EVALUATION SUB-TEST SCORES

Treatment group	Sex of Pupils	Reading levels			
		Q_1	Q_2	Q_3	Q_4
A	Boys	3.25	3.79	3.60	3.75
	Girls	2.94	2.52	3.60	3.76
B	Boys	2.30	2.31	2.32	3.18
	Girls	1.84	2.93	2.62	3.50

TABLE 49.--ADJUSTED MEANS OF EVALUATION SUB-TEST SCORES BY READING LEVELS

Reading levels			
Q_1	Q_2	Q_3	Q_4
2.57	2.84	3.07	3.60

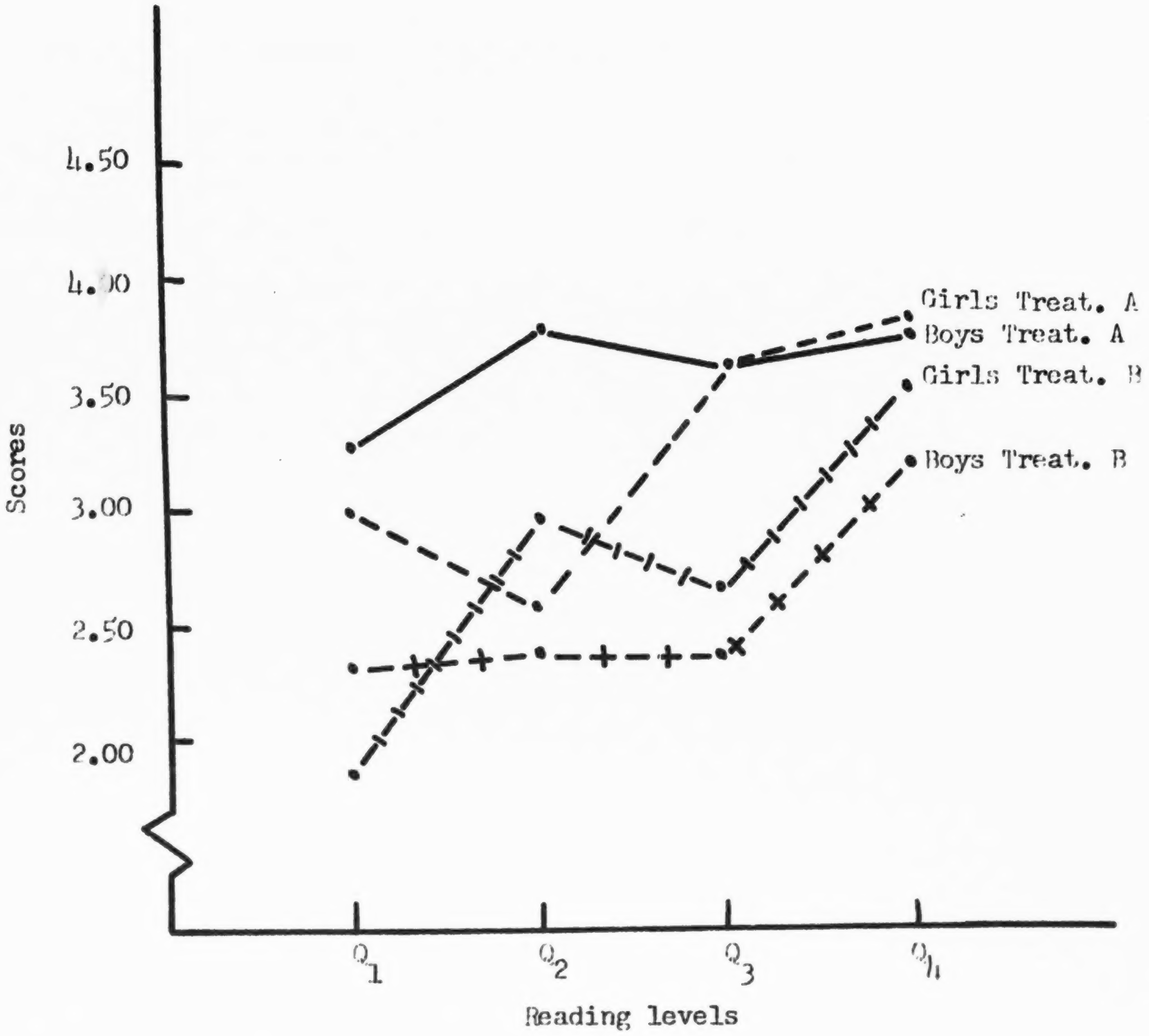

Figure XIII. -- Adjusted means for post-test evaluation achievement scores.

TABLE 50.--INTERCORRELATIONS OF PRE-TEST CRITICAL THINKING SCORES FOR TREATMENT A

	Inf.	Cau.	O-Gen.	Discrim.
Inference	1.00			
Caution	-.68**	1.00		
Over-Generalization	.49**	-.49**	1.00	
Discrimination	.36**	-.04	-.02	1.00

** = .01 sig.

TABLE 51.--INTERCORRELATIONS OF POST-TEST CRITICAL THINKING SCORES FOR TREATMENT A

	Inf.	Cau.	O-Gen.	Discrim.
Inference	1.00			
Caution	-.87**	1.00		
Over-Generalization	.53**	-.65**	1.00	
Discrimination	.46**	-.36**	.11	1.00

** = .01 sig.

TABLE 52.-- INTERCORRELATIONS OF PRE-TEST CRITICAL THINKING SCORES FOR TREATMENT B

	Inf.	Cau.	O-Gen.	Discrim.
Inference	1.00			
Caution	-.85**	1.00		
Over-Generalization	.42**	-.57**	1.00	
Discrimination	.41**	.33**	.007	1.00

**= .01 sig.

TABLE 53.-INTERCORRELATIONS OF POST-TEST CRITICAL THINKING SCORES FOR TREATMENT B

	Inf.	Cau.	O-Gen.	Discrim.
Inference	1.00			
Caution	-.90**	1.00		
Over-Generalization	.40**	-.51**	1.00	
Discrimination	.38**	-.34**	.05	1.00

** = .01 sig.

TABLE 54. -- INTERCORRELATIONS OF PRE-TEST ACHIEVEMENT SUBSCORES FOR TREATMENT A

	Knowl.	Comp.	Appl.	Anal.	Synth.	Eval.	Tot. Achieve.
Knowledge	1.00						
Comprehension	-.01	1.00					
Application	.20*	.14	1.00				
Analysis	.15	.14	.32**	1.00			
Synthesis	.07	.11	.23**	.30**	1.00		
Evaluation	.15	.04	-.06	.24**	.18*	1.00	
Total Achievement	.37**	.42**	.61**	.70**	.58**	.43**	1.00

** = .01 sig.
* = .05 sig.

TABLE 55. -- INTERCORRELATIONS OF POST-TEST ACHIEVEMENT SUBSCORES FOR TREATMENT A

	Knowl.	Comp.	Appl.	Anal.	Synth.	Eval.	Tot. Achieve.
Knowledge	1.00						
Comprehension	.23**	1.00					
Application	.26**	.21*	1.00				
Analysis	.34**	.33**	.44**	1.00			
Synthesis	.15	.23**	.44**	.47**	1.00		
Evaluation	.22**	.23**	.23**	.37**	.30**	1.00	
Total Achievement	.55**	.55**	.68**	.78**	.70**	.60**	1.00

** = .01 sig.

TABLE 56.--INTERCORRELATIONS OF PRE-TEST ACHIEVEMENT SUBSCORES FOR TREATMENT B

	Knowl.	Comp.	Appl.	Anal.	Synth.	Eval.	Total Pre Achieve.
Knowledge	1.00						
Comprehension	.08	1.00					
Application	.14	.15	1.00				
Analysis	.09	.22**	.26**	1.00			
Synthesis	.10	.26**	.27**	.17*	1.00		
Evaluation	.09	-.004	.31**	.14	.21*	1.00	
Total Pre-Achievement	.41**	.50**	.68**	.60**	.60**	.51**	1.00

** = .01 sig.
* = .05 sig.

TABLE 57.--INTERCORRELATIONS OF POST-TEST ACHIEVEMENT SUBSCORES FOR TREATMENT B

	Knowl.	Comp.	Appl.	Anal.	Synth.	Eval.	Total Post Achieve.
Knowledge	1.00						
Comprehension	.09	1.00					
Application	.27**	.10	1.00				
Analysis	.16	.18*	.34**	1.00			
Synthesis	.06	.18*	.14	.25**	1.00		
Evaluation	.19*	.05	.28**	.33**	.28**	1.00	
Total Post-Achievement	.53**	.46**	.63**	.65**	.55**	.61**	1.00

** = .01 sig.
* = .05 sig.

TABLE 58.--CORRELATIONS OF PRE-TEST CRITICAL THINKING SCORES WITH PRE-TEST ACHIEVEMENT SUB-TEST SCORES FOR TREATMENT A

Achievement Sub-tests	Critical Thinking Sub-Scores			
	Inf.	Cau.	O-Gen.	Discrim.
Knowledge	-.08	.13	-.11	-.09
Comprehension	-.10	.07	-.14	.11
Application	.11	.12	-.15	.25**
Analysis	.09	.14	-.17*	.47**
Synthesis	-.03	.13	-.05	.18*
Evaluation	.07	.15	-.06	.19*
Total Pre-Achievement	.005	.25**	-.22**	.43**

** = .01 sig.
 * = .05 sig.

TABLE 59.--CORRELATIONS OF POST-TEST CRITICAL THINKING SCORES WITH POST-TEST ACHIEVEMENT SUB-TEST SCORES FOR TREATMENT A

Achievement Sub-tests	Critical Thinking Sub-Scores			
	Inf.	Cau.	O-Gen.	Discrim.
Knowledge	.18*	-.10	-.04	.34**
Comprehension	-.11	.10	-.17*	.008
Application	.10	.05	-.08	.14
Analysis	.08	.03	-.28**	.23**
Synthesis	-.08	.15	-.22**	.12
Evaluation	.03	.01	-.07	.03
Total Post-Achievement	.05	.07	-.23**	.22**

** = .01 sig.
 * = .05 sig.

TABLE 60.--CORRELATIONS OF PRE-TEST CRITICAL THINKING SCORES WITH PRE-TEST ACHIEVEMENT SUB-TEST SCORES FOR TREATMENT B

Achievement Sub-tests	Critical Thinking Sub-Scores			
	Inf.	Cau.	O-Gen.	Discrim.
Knowledge	.13	-.13	-.05	.17*
Comprehension	.22**	-.12	-.04	.31**
Application	.19*	-.07	-.15	.30**
Analysis	.24**	-.13	-.07	.37**
Synthesis	.17*	-.15	.04	.22**
Evaluation	.08	.05	-.07	.19*
Total Pre-Achievement	.32**	-.17*	-.11	.48**

** = .01 sig.
* = .05 sig.

TABLE 61.--CORRELATIONS OF POST-TEST CRITICAL THINKING SCORES WITH POST-TEST ACHIEVEMENT SUB-TEST SCORES FOR TREATMENT B

Achievement Sub-tests	Critical Thinking Sub-Scores			
	Inf.	Cau.	O-Gen.	Discrim.
Knowledge	.05	.04	-.15	-.01
Comprehension	.12	-.03	.02	.18*
Application	.27**	-.13	-.17*	.22**
Analysis	.15	-.08	-.17*	.30**
Synthesis	.38**	-.28**	.06	.30**
Evaluation	.24**	-.11	-.03	.22**
Total Post-Achievement	.35**	-.17*	-.13	.35**

** = .01 sig.
* = .05 sig.

APPENDIX B

SCHEFFE'S TEST DATA

* To facilitate identification of the various means they are coded by quartile level and, where appropriate, treatment, e.g. $Q_1A - Q_3A$ refers to the comparison of the means of pupils in Quartile 1, Treatment A with the means of pupils in Quartile 3 of Treatment A.

** Only significant differences are reported.

TABLE 62.--SCHEFFE'S TEST FOR DIFFERENCES BETWEEN MEAN SCORES OF CAUTION SUB-TEST (TREATMENT BY READING LEVEL)

Contrast	Quartile & Treatment	Difference	Critical Factor	Confidence Interval
16.60 - 18.29	$(Q_1A - Q_3A)$	1.69	1.17	2.86 -- .52*
15.65 - 18.29	$(Q_2A - Q_3A)$	2.64	1.17	3.81 -- 1.47*
18.29 - 15.76	$(Q_3A - Q_4A)$	2.53	1.17	3.70 -- 1.36*
18.29 - 15.27	$(Q_3A - Q_2B)$	3.02	1.07	4.09 -- 1.95*
18.29 - 14.44	$(Q_3A - Q_3B)$	3.85	1.17	5.02 - 2.68*
13.24 - 18.29	$(Q_3A - Q_4B)$	3.13	1.17	4.30 -- 1.96*
17.23 - 15.27	$(Q_1B - Q_2B)$	1.96	1.07	3.03 -- .89*
17.23 - 14.44	$(Q_1B - Q_3B)$	2.79	1.17	3.96 -- 1.62*
18.29 - 15.16	$(Q_1B - Q_4B)$	2.07	1.27	3.34 -- .80*

*Significant at the .05.

TABLE 63.--SCHEFFE'S TEST FOR DIFFERENCES BETWEEN MEAN SCORES OF OVER-GENERALIZATION SUB-TEST (TREATMENT BY READING LEVEL)

Contrast	Quartile & Treatment	Difference	Critical Factor	Confidence Interval
6.81 - 5.71	$(Q_1A - Q_4A)$	1.10	.67	1.77 -- .43*
6.81 - 5.57	$(Q_1A - Q_3A)$	1.24	.62	1.86 -- .62*
6.81 - 5.87	$(Q_1A - Q_1B)$	.94	.62	1.56 -- .32*
6.81 - 5.47	$(Q_1A - Q_4B)$	1.34	.62	1.96 -- .72*
7.14 - 5.57	$(Q_2A - Q_3A)$	1.57	.62	2.19 -- .95*
7.14 - 5.71	$(Q_2A - Q_4A)$	1.43	.67	2.10 -- .76*
7.14 - 5.87	$(Q_2A - Q_1B)$	1.27	.62	1.89 -- .65*
7.14 - 5.47	$(Q_2A - Q_4B)$	1.67	.62	2.29 -- 1.05*
5.57 - 7.10	$(Q_3A - Q_2B)$	1.53	.62	2.15 -- .91*
5.57 - 6.93	$(Q_3A - Q_3B)$	1.36	.62	1.98 -- .74*
5.71 - 7.10	$(Q_4A - Q_2B)$	1.39	.72	2.11 -- .67*
5.71 - 6.93	$(Q_4A - Q_3B)$	1.22	.67	1.89 -- .55*
5.87 - 7.10	$(Q_1B - Q_2B)$	1.23	.56	1.79 -- .67*
5.87 - 6.93	$(Q_1B - Q_3B)$	1.06	.62	1.68 -- .44*
7.10 - 5.47	$(Q_2B - Q_4B)$	1.63	.67	2.30 -- .96*
6.93 - 5.47	$(Q_3B - Q_4B)$	1.46	.67	2.13 -- .79*

*Significant at the .05.

TABLE 64.--SCHEFFE'S TEST FOR DIFFERENCES BETWEEN MEAN SCORES OF DISCRIMINATION SUB-TEST (BETWEEN READING LEVELS)

Contrast	Quartile	Difference	Critical Factor	Confidence Interval
7.56 - 8.87	$(Q_1 - Q_4)$	1.31	.43	1.74 -- .88*
7.56 - 8.29	$(Q_1 - Q_3)$	.73	.34	1.07 -- .39*
7.60 - 8.29	$(Q_2 - Q_3)$	.69	.21	.90 -- .48*
7.60 - 8.87	$(Q_2 - Q_4)$	1.27	.24	1.51 -- 1.03*
8.29 - 8.87	$(Q_3 - Q_4)$	.58	.27	.85 -- .31*

*Significant at the .05.

TABLE 65.--SCHEFFE'S TEST FOR DIFFERENCES BETWEEN MEAN SCORES OF TOTAL ACHIEVEMENT TEST (BETWEEN READING LEVELS)

Contrast	Quartile	Difference	Critical Factor	Confidence Interval
22.73 - 16.42	$(Q_4 - Q_1)$	6.31	1.21	7.52 -- 5.10*
22.73 - 18.01	$(Q_4 - Q_2)$	4.72	.91	5.63 -- 3.81*
22.73 - 19.95	$(Q_4 - Q_3)$	2.78	.81	3.59 -- 1.97*
19.95 - 16.42	$(Q_3 - Q_1)$	3.53	.75	4.28 -- 2.78*
19.95 - 18.01	$(Q_3 - Q_2)$	1.94	.48	2.42 -- 1.46*
18.01 - 16.42	$(Q_2 - Q_1)$	1.59	.48	2.07 -- 1.11*

*Significant at the .05.

TABLE 66.--SCHEFFE'S TEST FOR DIFFERENCES BETWEEN MEAN SCORES OF KNOWLEDGE SUB-TEST (BETWEEN READING LEVELS)

Contrast	Quartile	Difference	Critical Factor	Confidence Interval
3.68 - 2.53	$(Q_4 - Q_1)$	1.15	.20	1.35 -- .95*
3.68 - 2.92	$(Q_4 - Q_2)$	.76	.18	.94 -- .58*
3.68 - 3.02	$(Q_4 - Q_3)$	.66	.20	.88 -- .46*
3.02 - 2.53	$(Q_3 - Q_1)$	.49	.11	.60 -- .38*

*Significant at the .05.

TABLE 67.--SCHEFFE'S TEST FOR DIFFERENCES BETWEEN MEAN SCORES OF COMPREHENSION SUB-TEST (BETWEEN READING LEVELS)

Contrast	Quartile	Difference	Critical Factor	Confidence Interval
3.21 - 2.66	(Q_4 - Q_2)	.55	.21	.76 -- .34*
3.21 - 2.71	(Q_4 - Q_1)	.50	.19	.69 -- .31*
3.21 - 2.79	(Q_4 - Q_3)	.42	.17	.59 -- .25*

*Significant at the .05.

TABLE 68.--SCHEFFE'S TEST FOR DIFFERENCES BETWEEN MEAN SCORES OF APPLICATION SUB-TEST (BETWEEN READING LEVELS)

Contrast	Quartile	Difference	Critical Factor	Confidence Interval
4.31 - 2.99	(Q_4 - Q_1)	1.32	.29	1.61 -- 1.03*
4.31 - 3.45	(Q_4 - Q_2)	.86	.24	1.10 -- .62*
4.31 - 3.78	(Q_4 - Q_3)	.53	.20	.73 -- .33*
3.78 - 2.99	(Q_3 - Q_1)	.79	.16	.95 -- .63*
3.78 - 3.45	(Q_3 - Q_2)	.33	.16	.49 -- .17*
3.45 - 2.99	(Q_2 - Q_1)	.46	.14	.60 -- .32*

*Significant at the .05.

TABLE 69.--SCHEFFE'S TEST FOR ANALYSIS SUB-TEST (BETWEEN READING LEVELS)

Contrast	Quartile	Difference	Critical Factor	Confidence Interval
4.04 - 2.70	(Q_4 - Q_1)	1.34	.32	1.66 -- 1.02*
4.04 - 2.75	(Q_4 - Q_2)	1.29	.25	1.54 -- 1.04**
4.04 - 3.31	(Q_4 - Q_3)	.73	.20	.93 -- .53*
3.31 - 2.70	(Q_3 - Q_1)	.61	.21	.82 -- .40*
3.31 - 2.75	(Q_3 - Q_2)	.56	.16	.72 -- .40*

*Significant at the .05.
**Significant at the .01.

TABLE 70.--SCHEFFE'S TEST DIFFERENCES BETWEEN MEAN SCORES OF SYNTHESIS SUB-TEST (BETWEEN READING LEVELS)

Contrast	Quartile	Difference	Critical Factor	Confidence Interval
3.89 - 2.91	$(Q_4 - Q_1)$	.98	.24	1.22 -- .74*
3.89 - 3.40	$(Q_4 - Q_2)$	.49	.18	.67 -- .31*
3.40 - 2.91	$(Q_2 - Q_1)$	.49	.15	.64 -- .34*
3.85 - 3.40	$(Q_3 - Q_2)$	.45	.15	.60 -- .30*
3.85 - 2.91	$(Q_3 - Q_1)$	.94	.19	1.13 -- .75*

*Significant at the .05.

TABLE 71.--SCHEFFE'S TEST FOR DIFFERENCES BETWEEN MEAN SCORES OF EVALUATION SUB-TEST (BETWEEN READING LEVELS)

Contrast	Quartile	Difference	Critical Factor	Confidence Interval
3.60 - 2.57	$(Q_4 - Q_1)$	1.03	.21	1.24 -- .82*
3.60 - 2.84	$(Q_4 - Q_2)$	.76	.17	.93 -- .59*
3.60 - 3.07	$(Q_4 - Q_3)$	.53	.21	.74 -- .32*
3.07 - 2.57	$(Q_3 - Q_1)$	.50	.17	.67 -- .33*
3.07 - 2.84	$(Q_3 - Q_2)$	.23	.15	.38 -- .08*
2.84 - 2.57	$(Q_2 - Q_1)$	.27	.15	.42 -- .12*

*Significant at the .05.

APPENDIX C

CONDENSED VERSION OF THE TAXONOMY OF EDUCATIONAL OBJECTIVES: COGNITIVE DOMAIN

CONDENSED VERSION OF THE
TAXONOMY OF EDUCATIONAL OBJECTIVES*

Cognitive Domain

Knowledge

Knowledge

Knowledge involves the recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure, or setting.

Knowledge of Specifics

The recall of specific and isolable bits of information.

Knowledge of Ways and Means of Dealing with Specifics

Knowledge of the ways of organizing, studying, judging, and criticizing.

Knowledge of the Universals and Abstractions in a Field

Knowledge of the major schemes and patterns by which phenomena and ideas are organized.

Intellectual Abilities and Skills

Comprehension

This refers to a type of understanding or apprehension such that the individual knows what is being communicated and can make use of the material or idea being communicated without necessarily relating it to other material or seeing its fullest implications.

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*Benjamin Bloom, ed., The Taxonomy of Educational Objectives: Cognitive Domain (New York: David McKay Co., Inc., 1956), pp. 201-207.

Translation

Comprehension as evidenced by the care and accuracy with which the communication is paraphrased or rendered from one language or communication to another.

Interpretation

The explanation or summarization of a communication.

Extrapolation

The extension of trends or tendencies beyond the given data to determine implications, consequences, corollaries, effects, etc., which are in accordance with the conditions described in the original communication.

Application

The use of abstractions in particular and concrete situations. The abstractions may be in the form of general ideas, rules of procedures, or generalized methods.

Analysis

The breakdown of a communication into its constituent elements or parts.

Analysis of Elements

Identification of the elements included in a communication.

Analysis of Relationships

The connections and interactions between elements and parts of a communication.

Analysis of Organizational Principles

The organization, systematic arrangement, and structure which hold the communication together.

Synthesis

The putting together of elements and parts so as to form a whole.

Production of a Unique Communication

The development of a communication in which the writer or speaker attempts to convey ideas, feelings, and/or experiences to others.

Production of a Plan, or Proposed Set of Operations

The development of a plan or the proposal of a plan of operations.

Derivation of a Set of Abstract Relations

The development of a set of abstract relations either to classify or explain particular data or phenomena, or the deduction of propositions and relations from a set of basic propositions or symbolic representations.

Evaluation

Judgments about the value of material and methods for given purposes.

Judgments in Terms of Internal Evidence

Evaluation of the accuracy of a communication from such evidence as logical accuracy, consistency, and other internal criteria.

Judgments in Terms of External Criteria

Evaluation of material with reference to selected or remembered criteria.

APPENDIX D

MATERIALS USED IN THE INVESTIGATION

This appendix contains samples of the materials that were employed in this investigation. Condition A's materials were numbered in the upper right-hand corner of the sheets, and Condition B's materials were numbered at the bottom-center of each page in order to facilitate proper identification by the investigator.

Introductory Worksheet General Directions

The purpose of this worksheet is to give you an opportunity to work with this type of material, so that any questions can be answered before you use other materials of this type.

A main point to remember in dealing with these materials is that you are to work alone. These worksheets are for you, not for your teacher to do.You will have to read the directions carefully and read your textbook carefully to answer each question. Some of the questions can be answered in only one word. Other questions will demand longer answers, but you do not need to worry about spelling or putting your answer in sentences. If you do put your answers in sentences this is good. With these materials we are concerned with ideas and thoughts.

This is an introductory worksheet today. After you have completed it and corrected your answers with the answer sheet, you may discuss any problems you had with your teacher. But remember, this will be the only time you will be allowed to do this. All right, let's get started--your on your own!

GENERAL DIRECTIONS FOR WORKSHEETS

These worksheets have questions which are to be answered in the spaces provided. If you need more space to answer a question, you may write on the other side of the worksheet. The space after each question is the same, and therefore, you should not assume that the large space means a long answer.

These worksheets are to be used with your textbooks. You will have twenty to twenty-five minutes to work on the worksheet. When you have finished, get an answer sheet and correct your answers, but do not erase anything which you have written. You will probably want to write down the correct answers to questions you missed in your social studies notebook.

These worksheets have sections to them. The number of sections varies, but specific directions will follow each section sheet. The pages in your textbook covered by the section sheet are noted in the directions.

In your textbooks, there are pages which deal with questinns concerning the chapter or section. You are not to answer these questions during the time you have for working on these worksheets. Many of the questions on these pages have already been considered in the worksheet sections. However, after you have corrected your worksheets, you may consider the questions in the text for your own benefit.

Your answers to the questions do not have to be written in complete sentences; one word may be all you need to get a meaningful answer. Sometimes you will find that the answer is clearer if you do write complete sentences or long phrases. Some of the questions will not have a definite right or wrong answer, but rather a best answer. You are correct in the case of two possible answers only if you give the correct reasons. Your answer may not have the exact wording as the answer sheet but if you have the general idea, then you can consider yourself to be correct.

INTRODUCTORY WORKSHEET

Directions: This worksheet covers the material in your textbook from page 48 starting with "Oil in the desert" to page 54 ending with "An old way to make use of the desert." The questions on this worksheet are to be answered in the spaces provided. The main purpose of these questions is to help you learn the material in your textbook. The space after each question is the same. A large space does not necessarily mean a long answer. If you need more space to answer a question, you may write on the other side of the worksheet. You have from twenty to twenty-five minutes to answer the questions.

This worksheet has an answer sheet. When you have finished answering the questions, get a worksheet and correct your work. You will have ten minutes. Do not erase any answers. You may write the correct answers to those questions you got wrong in your social studies notebook. Remember, work carefully.

1. What are the two ways in which oil is transported major distances?

2. In what activity do most of the people of these countries engage?

3. From what countries have most of the oil companies in the Middle East come?

4. What ancient people knew of oil?

5. What are the advantages of shipping oil by pipeline?

6. Think of as many ways in which oil can be used to develop this area?

7. Why do villagers want large families?

8. From your reading summarize the changes oil has brought to this part of the world?

9. Why do you think the Europeans depend upon oil from the Middle East and North Africa?

10. What are three products for which this area is famous?

Introductory Worksheet

11. Oil is worth a great deal of money, yet it states in your textbook that water is still more important. Why do you think this is true?

12. From the map, on page 48 and 49, what is shown to be the major mineral of the Middle East?

13. On page 54 it is stated that "land is better than gold." What is meant by this statement?

14. Look at the pictures on page 52 and page 53. Do you think the farming methods are efficient?

15. Why do you think the villagers cling to old ways of thinking?

16. From observing the map on page 48 and 49, what would you say is the outstanding feature of North Africa and the Middle East?

ANSWER SHEET FOR THE INTRODUCTORY WORKSHEET

Directions: This answer sheet is to be used by you to correct your work. It is made to assist you in your learning. Some answers have single words; others have groups of words, others have sentences. Your answers may not be exactly worded the same as on this answer sheet, but if they have the same general idea, you may count them correct.

1. Ship and pipeline

2. Farming

3. England and the United States

4. Sumerians

5. The advantages of shipping oil by pipeline are that the pipeline route is shorter, less expensive, and can be used at all times. Tankers only can be used half the time, the other half of the time, on return trips, they are empty.

6. Additional ways in which oil can be used to develop this area are as follows: to supply fuel and energy for various industries; to help pay for research; to make the lands more easily lived in; to help pay for building new buildings, cities. You most-likely have other reasons. Good.

7. Villagers want large families so that the children may help them. Boys help their fathers in the fields; girls help their mothers with household chores.

8. Oil has brought jobs to a large number of people. It has provided the countries with roads in many instances. Oil has brought modern conveniences, such as electricity, to some of the areas. This mineral has brought people, highly trained in oil technology and other industries, to live in this part of the world.

   Oil has made some of the rulers of these countries very wealthy. We can see that oil has helped to make these countries more modern.

9. Europe does not have any large supplies of oil but needs a lot of oil to run its industries. The Middle East and North Africa are the nearest major sources of oil. These areas are eager to sell their product.

10. Metal-work, high-quality leather goods, "oriental rugs."

Answer Sheet for Introductory Worksheet

11. Water is considered more important than oil for one needs water to live, grow plants, and raise animals. Oil cannot supply food directly; people cannot drink oil. Nations must have water for drinking, and basicly for agriculture.

12. Oil

13. The statement "land is better than gold" means that land can produce food and products which can be sold for money (gold). The land can support a person and his family for many years.

    Gold, on the other hand, does not produce anything. When one spends it, one gets something, but when the product wears out, there is no more gold. Gold by itself will not take care of a man and his family for years to come. You may have other reasons. Good.

14. Two possible answers to this question.

    Yes. If you answered the question this way, you should have the following reasons: no other tools are available; people cannot afford to have modern machinery; it supplies the people with food; this is the way it has always been done,

    No. If you answered the question this way, you should have the following reasons: the method does not supply much food for the effort put forth; modern machinery would grow more food and allow more people to do other things besides work in the fields; it would take a long time to plant and cultivate the area.

15. Villagers cling to old ways of thinking for the old ways are known to them and work fairly well. People in general don't like to change; change is uncertain. People sometimes don't trust things which are different.

16. Desert

Worksheet I
Section 1

1

A LOOK AT AFRICA

Directions: This worksheet covers the material in your textbook from page 382 to the end of page 389. This worksheet has questions which are to be answered in the spaces provided. If you need more space to answer a question, you may write on the other side of the worksheet. The space after each question is the same, and therefore, you should not assume that the large space means a long answer.

You will have twenty to twenty-five minutes to work on this worksheet with your textbook. When you have finished, get an answer sheet and correct your answers, but do not erase anything which you have written. You will probably want to write in your social studies notebook the correct answers to the questions you missed. Read carefully; think before you answer each question.

1. Do you think the picture of the herdsman on page 387 shows a wise use of land?

2. What is the significance of the Sahara in relation to the peoples of Africa?

3. Africa is called a land of contrasts. List some contrasts you can find in your reading to give further support to this statement?

4. Why do you think the major lakes of Africa are located where they are?

Worksheet I, Section 1

5. All of the pictures in this section show Negroes. Why do you think the author has done this?

6. In what ways have the rivers of Africa hindered the development of the continent?

7. Describe the general geography of Ethiopia?

8. What do you think people would do for a living and for recreation in Ethiopia?

9. Why do you think the Congo River has been called the greatest river south of the Sahara?

10. Do you feel that the author has written this section in the text so as to show the idea that Africa is a land of contrast ?

Worksheet I, Section 1

11. Rivers in Ethiopia flow from the country, not into the country. Why?

12. The author states that Ethiopia has remained free because of what geographic feature?

ANSWER SHEET FOR WORKSHEET I, Section 1

A LOOK AT AFRICA

Directions: This answer sheet is to be used by you to correct your work. It is made to assist you in your learning. Some answers have single words; others have groups of words; others have sentences. Your answers may not be exactly worded the same as on this answer sheet, but if they have the same general idea, you may count them correct.

1. There are two possible answers to this question.

   If yes, then you should have answered something like the following sentences. The picture of the herdsman does show a wise use of land, for the land is too dry to grow crops. Cattle seem to survive in this area. People need the products of these animals. The people of the area have nothing else to do, so this is the best activity for them.

   If no, then you should have answered something like the following sentences. The picture does not show a wise use of land, for the land is too dry to support healthy cattle. The land with irrigation water perhaps could be made fertile. The person in the picture does not wear cattle skins so the animals are not raised for their hides. Other animals might be raised much more easily. Perhaps crops could be grown with the limited amount of water that is available.

2. The Sahara has kept people from southern and northern Africa from mixing cultures. (This has not been the case in North Africa or Asia.) This desert has made various regional activities differ greatly from each other.

3. Possible contrasts: tribal villages--modern cities; herding of animals--mining; tropical forests--deserts; forests--grasslands; plateaus-mountains; tropical climate--temperate climate; modern highways--foot paths. You may have others. Good.

4. The major lakes of Africa are located where they are for the following possible reasons: this area has a lot of rain; this area is fairly near the ocean, and rain-bearing winds from ocean cross the area of lakes; this area has deep valleys where water can collect to form lakes. You may have other reasons; this is good thinking.

Answer Sheet for Worksheet I, Section 1

5. Possible answers for this question are as follows: to show that Africa, south of the Sahara, has mostly Negroes; to show the natives working; to show you the various types of Africans; this particular textbook's information is concerned mostly with Negroes. Perhaps the author has just overlooked the white man in this particular section.

6. The rivers of Africa hindered the development of the continent in several ways. They did not permit boats to go their entire distance, thus an easy way into the interior of Africa was not available. Falls on the rivers made it necessary for goods to be transported by several methods into the interior. The settlement of the various areas and travel among the various groups of peoples was largely prevented by the difficulty of river travel.

7. Ethiopia is a mountainous land with elevations from 1000 to 10,000 feet. It is a land which is poor farmland. Much of the land is covered by forest.

8. Possible answers. The people of Ethiopia would engage in agriculture even though the farmland is poor. Many of the people would raise sheep and other animals. A few people would work in the various villages and cities. You may have other possible answers; this shows thinking on your part.

9. Possible answers. The Congo River might be called the greatest river south of the Sahara because it is large and has great water power. It also is the main river into the central part of the continent. It serves as a major avenue in transporting certain goods to various river ports.

10. There are two possible answers to this question.

    If yes, the following are possible reasons. The author states that Africa has much grassland while other parts are thickly forested. The author mentions other contrasts such as the deserts and grassland. The varying ways of making a living are presented for the reader. The pictures in the text show some contrasts.

    If no, the following are possible reasons. All areas of the world, taken on a broad scale, have contrasts; Africa is not alone. Africa has more similarities than differences. The climate of most of Africa can be considered less contrasting than that of North America. The rivers of Africa, south of the Sahara, are similar in that boats cannot use the rivers for their entire lengths. You may have had other reasons to back up your answers. Good, you are thinking.

Answer Sheet for Worksheet I, Section 1

11. Rivers flow outward from Ethiopia because of the landscape features of the land--high mountains over much of the country. Rivers originate, begin, in the mountains. Ethiopia is high plateau in many areas, and rivers flow from plateaus, not into them.

12. High mountains

Worksheet I
Section 1

A LOOK AT AFRICA

Directions: This worksheet covers the material in your textbook from page 382 to the end of page 387. This worksheet has questions which are to be answered in the spaces provided. If you need more space, you may write on the other side of the worksheet. The space after each question is the same. Do not assume that the large space means a long answer.

You will have twenty to twenty-five minutes to work on this worksheet with your textbook. When you have finished, get an answer sheet and correct your answers, but do not erase anything you have written. You will probably want to write in your social studies notebook the correct answers to questions you missed. Read carefully and think before you answer each question.

1. What are three important lakes in Africa?

2. How are most goods transported to Leopoldville?

3. What is the major river of western Africa?

4. What prevents the Niger River from being used effectively for water travel?

5. Boats can navigate the Congo as far up river as what city?

6. Where are most of the forests in Africa located?

7. What lake is the source of the Nile River?

8. What is the approximate distance across Africa at its widest point?

9. What has prevented the rivers of Africa from serving as "roads" to the central parts of the continent?

10. Where are most of the lakes of Africa located?

Worksheet I, Section 1

11. What city serves as the ocean port of Leopoldville?

12. Besides the Sahara, what other area of Africa is dry?

13. What has divided Africa into two parts?

14. Name two famous mountains in Africa?

15. Why have the people of Africa, south of the Sahara, not associated closely with the people of North Africa?

16. What is the most important river south of the Sahara?

17. Leopoldville is the capital of what country?

18. What major types of natural vegetation are found south of the Sahara?

19. In what direction does the Nile River flow?

20. What type of vegetation is found in Africa near the equator?

21. What is the largest of the African lakes?

ANSWER SHEET FOR WORKSHEET I, Section 1

A LOOK AT AFRICA

Directions: This answer sheet is to be used by you to correct your work. It is made to assist you in your learning. Some answers have single words; others have groups of words; others have sentences. Your answers may not be exactly worded the same as on this answer sheet, but if they have the same general idea, you may count them correct.

1. Lake Rudolf, Lake Victoria, Lake Tanganyika, Lake Nyasa
2. By railroads
3. Niger River
4. Sandbars, delta which is overgrown, swampy area
5. Stanleyville
6. Near the equator, in lands drained by Congo River
7. Lake Victoria
8. 4,500 miles; one and a half times the distance across the United States.
9. Cataracts, rapids, falls
10. African plateau
11. Matadi
12. Possible answers: southwestern part; southern part; the southwest coast
13. The Sahara Desert
14. Mount Kenya and Mount Kilimanjaro
15. People of Africa, south of the Sahara, have not associated closely with people of North Africa because of the difficulty in crossing the Sahara desert.
16. Congo River
17. Republic of the Congo
18. Forest and grassland

Answer Sheet for Worksheet I, Section 1

19. North

20. Tropical evergreen forest

21. Lake Victoria

NAME - - - - - - - - -

Worksheet II
Section 2

THE PAST SOUTH OF THE SAHARA

Directions: This worksheet section covers the textbook from page 395 "Trading Cities" to the end of page 398. Some of the questions also are concerned with the previous pages in your textbook. Read each question carefully and answer in the spaces provided. Remember, if you need more room, you may write on the other side of this worksheet section. You have from twenty to twenty-five minutes to answer these questions. Think carefully. When you have finished, get an answer sheet and correct your work.

1. From looking at the pictures on pages 396 and 397 and the maps on pages 384 and 385, explain the reasons for the type of buildings and the type of clothes common to the areas?

2. Salt was an important item in west African trade. Why do you suppose this was true?

3. Explain why the major trading cities in Western Africa were located along the western edge of the Sahara?

4. Do you think that Mombasa and Zanzibar are well located or poorly located if you consider their major function? Explain.

5. Along the east coast are two trading cities. Locate them on your map?

Worksheet II, Section 2

6. What was an important trading city of West Africa?

7. Where did most of the Moslems live?

8. What were the two ways by which Africans south of the Sahara obtained salt?

9. Describe the way of life of the Moslems of western Africa?

10. Some parts of the eastern coast of Africa were settled by Arabs. Discuss in what ways their culture differed from the other Africans south of the Sahara?

THE PAST SOUTH OF THE SAHARA

Directions: This answer sheet is to be used by you to correct your work. It is made to assist you in your learning. Some answers have single words; others have groups of words; others have sentences. Your answers may not be exactly worded the same as on this answer sheet, but if they have the same general idea, you may count them correct.

1. The buildings were built from mud brick because of lack of trees, no wood, and a plentiful supply of soil from which the brick could be made. The lack of rain made it all right to use dried mud for building. Also the vegetation was limited, so that houses could not be made from weaving plant leaves together, such as was the case with thatch-roof dwellings.

   The clothes of the people are such because in this climate, one needs clothes to protect themselves from the sun and sand, and also clothes which protect from the coolness of the night. Also the animals which these people raised provided them with a lot of material for cloth.

2. Salt was important for it was needed to preserve food. Salt was and is important in the food diet of the people and the animals. You might have other reasons. Good.

3. The major trading cities in western Africa were located along the western edge of the Sahara because this was on the "coast" of a great "sand sea." People needed cities where they could trade and get supplies, especially water, before heading across the great desert. If trading centers had not been on the edge of the desert, but rather on the real coast, caravans would have been less able to make the trip due to the added distance.

4. There are two possible answers; the best possible one is yes.

   If you answered yes, you should have some of the following reasons. Both were trading cities and needed to be located near trade routes and the inland regions. The two cities were located on the Indian Ocean and had fairly easy access into the interior. The climate of the cities would be cooled somewhat by the nearness to water, making living quite pleasant. The cities were located away from the interior and its hostile savages.

   If you answered no, the following are some reasons you should have had. Both cities were not on rivers which prevented easy access into the interior. The cities were on coastal plains where disease was always present. The coastal plains of the tropics are hot with a lot of rain. You may have had other reasons. Fine.

5. Mombasa and Zanzibar

6. Timbuktu

7. In northern Africa and in the region just immediately south of the Sahara

8. By evaporating sea water, by trade

9. The Moslems of western Africa engaged in a great deal of trade and built large cities which were trading centers. The center of activity in these cities was at the mosque or Moslem church. The Moslems had a high regard for learning. Most of the Moslem women wore veils over their faces, but in this part of Africa they were known to show their faces. The social relations, conversations, between men and women was not usually done in public. Moslems believe in the God, Allah. You may have had other things to add, wonderful.

10. The Arabs were Moslems, while the Africans south of the Sahara were not. Arabs engaged in a lot of trade, while the southern Africans usually did not. The dress of the two groups was different. The languages of the groups differed. The houses they lived in and the food they ate was different.

You may have other points of differences, good.

NAME - - - - - - - - - -

Worksheet II
Section 2

THE PAST SOUTH OF THE SAHARA

Directions: This worksheet section covers the textbook from page 395 "Trading Cities" to the end of page 398. Some of the questions also are concerned with the previous pages in your textbook. Read each question carefully and answer in the spaces provided. Remember, if you need more room, you may write on the other side of this worksheet section. You have from twenty to twenty-five minutes to answer these questions. Think carefully. When you have finished, get an answer sheet and correct your work.

1. What was the most important building in Timbuktu?

2. What city in western Africa was an important trading center?

3. What was and is the religion of the Arabs?

4. What were the two ways Africans south of the Sahara got salt?

5. How did traders get to western Africa?

6. How can a people who have no written language have a history?

7. Why was Timbuktu not built directly on the river?

8. Why did the herding tribes have to be fierce and aggressive?

9. What were several ways in which the people of western Africa just south of the Sahara differed from the peoples of southern Africa?

Worksheet II, Section 2

10. What area of Africa was greatly influenced by the spread of the Moslem religion?

11. What were two important trading cities on the east coast of Africa?

12. From what areas of the world did the Arabs bring trade?

13. Who worked the salt mines?

14. What is the Koran?

Worksheet II, Section 2

15. Consider the area. From what material do you think most of the ancient buildings in western Africa would be made?

16. What brought the Arabs to Africa?

17. Salt was an important item in west African trade. Where was it mined?

18. What trading city is located on the Niger River?

19. The Bushmen live in the Kalahari Desert. Where is this desert?

ANSWER SHEET FOR WORKSHEET II, Section 2

THE PAST SOUTH OF THE SAHARA

Directions: This answer sheet is to be used by you to correct your work. It is made to assist you in your learning. Some answers have single words; others have groups of words; others have sentences. Your answers may not be exactly worded the same as on this answer sheet, but if they have the same general idea, you may count them correct.

1. The Mosque

2. Timbuktu

3. Moslem

4. By evaporating sea water, by trading

5. By camel caravan

6. History is a recording of events. The Africans recorded history in the minds of the people by telling stories of important past events. Certain people had the task of remembering these events, the history, of the tribe or group. You may have other reasons. Good.

7. To keep the city out of water's reach when the Niger River flooded its banks

8. To protect their herds from raiders and from wild animals

9. Africans in western Africa were Moslem and Arab. The people of western Africa wrote and spoke Arabic. These people engaged in a lot of trade and built fine cities. Many of these peoples were of the white race. Africans south of the Sahara were and are mostly Negro. These peoples were farmers and hunters and herders, and they did not usually build elaborate houses or cities.

10. The entire area of North Africa and the region which is just south of the Sahara were greatly influenced by the spread of the Moslem religion.

11. Mombasa and Zanzibar

12. From Arabia, India, Southeast Asia, and China

13. Slaves

14. The Moslem holy book

15. Mud brick

Answer Sheet for Worksheet II, Section 2

16. Gold, ivory, slaves

17. In the Sahara Desert

18. Timbuktu

19. In Southern Africa, Bechuanaland

Worksheet III
Section 3

NAME - - - - - - - - - - --

CHANGES SOUTH OF THE SAHARA 215 1

Directions: This section covers the material in your textbook from page 417, "Crops Africa borrowed" to page 421, "People and Countries." Do not answer the questions on page 421, for this section will deal with them in other questions. Read each question carefully before answering in the spaces provided. You have from twenty to twenty-five minutes to work with this worksheet. When you have finished, get an answer sheet and correct your work. Do not erase anything you have written on the worksheet. You may wish to write the correct answers to those questions you missed in your social studies notebook.

1. What are the two major clove-producing areas in Africa?

2. What two countries sell cola nuts to the United States?

3. Do you feel that the African farmers make wise use of the grain kafir? Why?

4. Where do cacao trees grow in Africa?

5. From your reading about uranium, what can you state about the development of this industry during the 20th century?

6. The author mentions two uses of African diamonds, for rings and for industry. Think of as many ways that industry might use diamonds?

7. Do you think that Africa, as a whole, south of the Sahara is making wise use of its water-power potential? Why?

8. Do you think the Africans make a wise use of the peanut plant? Why?

9. The transportation system in Africa, south of the Sahara, presents contrasts. Why is the transportation available so varied? Explain.

10. Do you think that palm oil is well used by Africans and other peoples? Why?

11. Why do you suppose that rice is grown in the lowlands of western Africa?

12. On page 317 is the statement that European farmers plant a very productive hybrid corn, but that very few Africans know much about it, and could not afford to buy the seed even if they did. What does this statement mean?

ANSWER SHEET FOR WORKSHEET III, Section 3

CHANGES SOUTH OF THE SAHARA

Directions: This answer sheet is to be used by you to correct your work. It is made to assist you in your learning. Some answers have single words; others have groups of words; others have sentences. Your answers may not be exactly worded the same as on this sheet, but if they have the same general idea, you may count them correct.

1. Zanzibar and Madagascar (Malagasy Republic)

2. Nigeria and Sierra Leone

3. This question has two possible answers.

   Yes, the Africans feed it to livestock. They grind the grain into flour. They build fences and huts from the plant stalks.

   No, the Africans could perhaps use the plant to supply chemicals, raw materials, to industry. Perhaps a better grain could be used. It might be better to plow under the plant stalks to improve the soil and make fences and huts from other materials.

4. In western Africa

5. Uranium shows us that the demands of industry change. What is worthless at one time may be worth a lot of money at another time. Uranium has helped industry to enter into the "atomic age." It helped the United States win the Second World War. It has made parts of Africa quite wealthy. Uranium shows that things in this world are constantly changing. Industry is changing.

6. For drills, for polishing purposes, for saws, for use in machinery watches, for chemical industry. You may have thought of others, fine.

7. There are two possible answers to this question. No is the best possible one.

   No, most of the rivers in Africa have not been developed at all for power in relation to their potential or how much they could be developed. Many new power dams could be built. The industries and villages and cities of this area need to have electricity. There is a great need for electricity, if only the Africans would develop it. However, it will take time.

8. This question has two possible answers.

   Yes, they use the nuts for oil and food. They use the plants to feed the livestock. They really get complete use of the plant.

   No, the Africans could use the plant in more ways than they are doing. They could use the plant for the basis of chemicals in the chemical industry.

   You may have had other reasons to back up your answers. Fine.

9. The transportation in Africa, south of the Sahara, is so varied because the needs and facilities are varied. Some places have no roads. Here foot and animal travel are best. Bicycles are good for they can go almost anywhere. Some places have roads. Here cars and trucks can be used.

   The area has many cultures and is in many stages of development. These two reasons, varied cultures and development stages, cause the variety of ways of transportation.

10. There are two possible answers to this question. Yes is the best possible one.

    Yes, because palm oil is used for food, for making soap, for candles, for lubricants, even hair oil.

    No, the Africans could find better and more uses for this oil such as in the chemical industry. The Africans could invent entirely new uses. Most native Africans use the oil only for food.

11. Rice is grown in the lowlands of western Africa because the temperature is right and enough rain falls. Also, the land is fairly flat which makes the construction of rice paddies fairly easy.

12. This statement means that the farming economy, for commercial farming, is controlled by European Africans. This means that the native black Africans are not given adequate agricultural training in their countries while the Europeans do receive such training. This statement also means that the amount of money among the various European African and the native African farming communities is not equal. The native Africans need to receive improved opportunities, something better for the future.

NAME - - - - - - - - - -

Worksheet III
Section 3

CHANGES SOUTH OF THE SAHARA

Directions: This section covers the material in your textbook from page 417, "Crops Africa borrowed" to page 421, "People and Countries." Do not answer the questions on page 421, for this section will deal with them in other questions. Read each question carefully before answering in the spaces provided. You have from twenty to twenty-five minutes to work with this worksheet. When you have finished, get an answer sheet and correct your work. Do not erase anything you have written on the worksheet. You may wish to write the correct answers to those questions you missed in your social studies notebook.

1. In what way does Africa have an enormous power potential?

2. What two major uses do the Africans find for peanuts?

3. What country in Africa produces the most gold?

4. What is made from cacao?

5. What two areas in Africa produce uranium?

6. What is the major clove producing area of Africa?

7. List at least five crops which Africa has borrowed from other parts of the world?

8. What plant, from which we produce a drink, is native to Ethiopia?

9. What is the major palm oil producing area of Africa?

10. What is the major crop of the lowlands of western Africa?

11. What is still the major activity of the Africans?

12. Discuss the development of transportation in Africa today?

Worksheet III, Section 3

13. What has become a major ore of the Congo with the coming of the atomic age?

14. List three uses of palm oil?

15. For what is kafir used?

16. What two drinks did Africa give to the world?

17. In what African things were the early European traders interested?

18. In the past, Africa sold raw materials to Europe. Discuss how this has and is changing?

19. How many times is cacao harvested a year?

Worksheet III, Section 3

20. Who were the people most likely responsible for bringing rice to Africa?

21. From what area of the world were clove trees brought to Africa?

22. Where are most of the diamonds in Africa mined?

ANSWER SHEET FOR WORKSHEET III, Section 3

CHANGES SOUTH OF THE SAHARA

Directions: This answer sheet is to be used by you to correct your work. It is made to assist you in your learning. Some answers have single words; others have groups of words; others have sentences. Your answers may not be exactly worded the same as on this answer sheet, but if they have the same general idea, you may count them correct.

1. Africa has an enormous, large, power potential in the water power of its rivers, especially the Congo River.
2. Peanuts used for food, peanut oil used for food, peanut plants used for food for livestock
3. Union of South Africa
4. Chocolate, coco
5. Congo region and South Africa
6. Islands of Zanzibar and Madagascar (Malagasy Republic)
7. Rice, sugar cane, clove, corn, sweet potatoes, peanuts, cacao tobacco, pineapple
8. Coffee
9. Niger River area, western Africa
10. Rice
11. Farming, agriculture
12. The development of transportation is one of contrast and change; change which is still taking place. The Europeans put steamboats on the rivers and on some of the large lakes. Railroads were built by European money. The bicycle came into being. The bicycle proves to be a very useful means of transportation, for it does not need good roads, nor fuel. Some parts of Africa do have good automobile roads. Air travel in Africa has developed quite rapidly in some parts of the continent. Change is really present.
13. Uranium
14. For making soap, candles, lubricants
15. Feed for livestock
16. Coffee and cola
17. Ivory, slaves, gold
18. Today a growing number of industries, such as steel, textile, bakeries, tanneries, shoe factories, service industries, building industries, and transportation industries are coming into being. They are demanding new materials which can be supplied by African natural resources. Most of these factories are in the Union of South Africa. But, the newer countries are encouraging the development of manufacturing in their lands also.

Answer Sheet for Worksheet III, Section 3

19. Twice a year

20. Arabs

21. Indonesia

22. In the Congo region

Worksheet IV
Section 4

NAME - - - - - - - -

PAST AND PRESENT IN AUSTRALIA AND NEW ZEALAND

Directions: This section covers the material in your textbook from page 444, "Changing the landscape" to page 448, "Australia's mines and factories." Do not answer the questions on page 445, as they already are considered in the section materials. You have from twenty to twenty-five minutes to work with this worksheet. When you have finished, get an answer sheet and correct your work.

1. What are some major crops of Australia?

2. What similarities does the Australian Parliament have with the American Congress?

3. What were four animals which Europeans brought to this new land?

4. Wheat is Australia's major crop. Why do you suppose this is so?

5. Name two ways in which the settlement of Australia was like the settlement of North America?

6. What reason or reasons can you give for rabbits over-running the countryside and causing great damage to crops in Australia and New Zealand?

7. What are four ways in which the Europeans changed the Australian and New Zealand landscapes?

8. Why do most Australians live in the eastern part of their country?

9. Sheep and cattle are more important than crops in Australia. Why is this so, and how does the raising of these animals affect the economy of the country?

10. Do you think that the Europeans were wise to bring in plants and animals from Europe to Australia and New Zealand?

11. The Maoris had the most success in living with the Europeans. Why do you think this was so?

12. The future development of farming in Australia depends upon supplying the farm crops with adequate water. The Australians are building some dams to store runoff water for irrigation use. Write other ways which you think the Australians could use to supply water to their dry continent?

PAST AND PRESENT IN AUSTRALIA AND NEW ZEALAND

Directions: This answer sheet is to be used by you to correct your work. It is made to assist you in your learning. Some answers have single words; others have groups of words; others have sentences. Your answers may not be exactly worded the same as on this answer sheet, but if they have the same general idea, you may count them correct.

1. Apples, pears, citrus fruits, bananas, pineapples, hay, feed for livestock.

2. It has a Senate and a House of Representatives. The members of the Parliament are elected in the same manner as are the members of the American Congress.

3. Pigs, goats, rabbits, deer, birds, weasels, cats

4. There are several reasons why wheat is Australia's main crop. The country is quite dry. Wheat does not need a great deal of water. The climate of the country is well suited for the growth of wheat--not much rain and fairly warm temperatures during the growing season.

5. Convicts were sent to both areas and both areas were settled at first mostly by English. The natives of both areas were pushed off their land by the European settlers. Another way in which the settlement of the two areas was the same was that the settlements started from the coast and worked toward the interior. Missionaries came to both areas. Settlers came to both areas seeking a better life.

6. The rabbits were a new animal to the area and had no natural enemies which would keep their numbers down. Since no natural enemies were present, and man could not kill the rabbits fast enough,they multiplied at a very rapid rate. The area also had a lot of grassland which provided food for the rabbits. The climate also was favorable to the growth of rabbits.

7. Dug mines, built cities, railroads, roads, cleared land for farms

8. This part of the country has the most favorable climate with adequate rainfall the year round so that agriculture can be carried on. There also is adequate water for settlement and industry. You might have other answers.

8. Sheep and cattle are more important than crops because much of the land is grassland, too dry for crops, but not for grazing animals. The economy of Australia is one of exporting wool and beef to other parts of the world, mostly to England and Europe. Before refrigerator ships, it was difficult to send beef the long distance to Europe. Now these refrigerator ships have made it possible to ship beef far distances. This has brought additional money to the Australian economy.

10. There are two answers to this question. Yes is the best possible one.

If yes was your answer, the following reasons would defend your statement. These new lands did not have the animals or plants necessary to produce food in sufficient quantities to support the new population that was arriving. The import of these animals made the life of the settlers better by supplying them with good food and milk. The plants brought in helped to make good feed for these animals, also food for the settlers. Some of the plants improved the soil's fertility.

No, the animals were not needed. The settlers could havelearned to use the animals present in these new lands and raise them. There was no need to import trees from Europe. The animals which were brought have multiplied too fast and now are a hazard. The settlers should have realized that the animals would have had no natural enemies to keep their number within reason.

11. The Maoris had the most success in living with the Europeans because they, the Maoris, had a more advanced culture than the aborigines. The Maoris had more in common with the Europeans and more easily took on some of the ways of the white man. Many of them were also converted to the white man's religion by the missionaries. The Maoris were already cultivating the lands in many instances, but enough land was left so that the Europeans did not try to force them off. The Maoris also were more war-like than the aborigines. They outnumbered the Europeans, thus the Europeans were less likely to push the Maoris off their land.

12. The following are some of the answers you could have given. Wells could be dug to give Australia more water. Sea water could have the salt taken out. Underground dams could be built to store water from various sources so that the collected water would not evaporate.

You most likely have thought of other ways, good.

NAME - - - - - - - - - - - -

Worksheet IV
Section 4

PAST AND PRESENT IN AUSTRALIA AND NEW ZEALAND

Directions: This section covers the material in your textbook from page 444, "Changing the landscape" to page 448, "Australia's mines and factories." Do not answer the questions on page 445, as they already are considered in the section materials. You have from twenty to twenty-five minutes to work with this worksheet. When you have finished, get an answer sheet and correct your work.

1. What were four edible plants which the Europeans brought to this part of the world?

2. List five plants not edible for humans which the Europeans brought to Australia and New Zealand?

3. What agricultural activity is more important to the Australians than crop raising?

4. Where are the best grasslands located in Australia?

5. Why did Australian settlers begin raising sheep?

6. Where is sugar cane grown in Australia?

7. The Maoris had the most success in living with the Europeans. Why do you think this was so?

8. What were four animals which the Europeans brought to these new lands?

9. What are the two types of government which Australia has?

10. What are five fruits which are grown in Australia?

11. What reason or reasons can you give for rabbits over-running the countryside and causing great damage to crops in Australia and New Zealand?

12. Name two ways in which the settlement of Australia was like the settlement of North America?

13. Wheat is Australia's main crop. Why do you suppose this crop is the major one?

14. Where are most of the dairy farms located in Australia?

15. Where are most of the cattle grazed in Australia?

16. What similarities does the Australian Parliament have with the American Congress?

17. The future development of farming in Australia depends upon supplying the farm crops with adequate water. The Australians are building some dams to store runoff water for irrigation use. Write other ways which you think the Australians could use to supply water for their dry continent?

18. What has allowed the Australians to ship beef to all parts of the world?

19. What are Australian cattle ranches called?

20. What are four ways in which the Europeans have changed the Australian and New Zealand landscapes?

21. Why does Australia have so small an area devoted to farming?

22. What is the federal capital of Australia?

ANSWER SHEET FOR WORKSHEET IV, Section 4

PAST AND PRESENT IN AUSTRALIA AND NEW ZEALAND

Directions: This answer sheet is to be used by you to correct your work. It is made to assist you in your learning. Some answers have single words; others have groups of words; others have sentences. Your answers may not be exactly worded the same as on this answer sheet, but if they have the same general idea, you may count them correct.

1. Potatoes, turnips, carrots, parsnips
2. Oaks, elms, willows, poplars, grasses and hay
3. Raising sheep and cattle
4. In the eastern highlands
5. The Australian settlers began raising sheep because of the grassland available in the country and the ease of sheep raising. Also wool was easy to ship and did not spoil during shipment.
6. Northeastern coast
7. The Maoris had the most success in living with the Europeans because they had a more advanced culture than the aborigines. The Maoris had more in common with the Europeans and more easily took on some of the ways of the white man. Many of them were also converted to the white man's religion by the missionaries. The Maoris were already cultivating the lands in many instances, but enough land was left so that the Europeans did not try to force them off. The Maoris also were more war-like than the aborigines. The Maoris outnumbered the Europeans, thus the Europeans were less likely to push them off their land.
8. Pigs, goats, rabbits, deer, birds, weasels, cats
9. State and federal governments
10. Apples, pears, bananas, pineapples
11. The rabbits were a new animal to the area and had no natural enemies which would keep their numbers down. Since no natural enemies were present, and man could not kill the rabbits fast enough, they multiplied at a very rapid rate. The area also had a lot of grassland which provided food for the rabbits. The climate also was favorable to the growth of rabbits.
12. Convicts were sent to both areas and both areas were settled at first mostly by English. The natives of both areas were pushed back off their land by the European settlers. Another way in which the settlement of the two areas was the same was that the settlements started from the coast and worked toward the interior. Missionaries came to both areas. Settlers came to both areas seeking a better life.

13. There are several reasons why wheat is Australia's main crop. The country is quite dry. Wheat does not need a great deal of water. The climate of the country is well suited for the growth of wheat--not much rain and fairly warm temperatures during the growing season.

14. Along the east coast

15. On the grasslands of northern Australia

16. It has a Senate and a House of Representatives. The members of the Parliament are elected in the same manner as are the members of the American Congress.

17. The following are some answers which you could have had. Wells could be dug to give Australia more water. Sea water could have the salt taken out. Underground dams could be built to store water from various sources, so that the collected water would not evaporate.

    You most likely have thought of other ways, good.

18. The refrigerator ship

19. Cattle stations

20. Dug mines, built cities, railroads, roads, cleared land for farms

21. Large area too dry for farming

22. Canberra

APPENDIX E

SOCIAL STUDIES INFERENCE TEST

SOCIAL STUDIES INFERENCE TEST*

Grade 6

Explanation to Students:

This booklet has some stories. After each story there are some sentences about the story. First, I will read the story out loud to you and you can follow along in your booklet. Then I will read each of the sentences and you are to decide whether the sentence is probably true, probably false, or if you can't tell from the story whether the sentence is probably true or probably false.

Decide on an answer for each sentence that I read to you. Mark your answer with a heavy black mark on the answer sheet. Do not write on the test. If you think the answer is probably true, mark in the space A. If you think the answer is probably false, mark in the space C. If you can't tell from the story whether the sentence is probably true or probably false mark in the space B.

Some of the sentences are "Probably True" and some of the sentences are "Probably False." You can't tell if some of them are true or false.

Example:

> Mr. Jones was a farmer in the midwest. When he heard about the discovery of gold in California he left his family and went to California.
>
> 1. Mr. Jones went with his family to California.
>
> 2. Mr. Jones went to California because he did not like the place in which he lived.

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* Developed by Hilda Taba, San Francisco State College. Reproduced, with permission, at Bureau of Educational Research, Kent State University.

Martha left her school friends and moved with her family to America. Soon after she got to America she started to school. On her first day at school the other children looked at Martha and talked about her. She did not speak to the other children, and at recess she sat alone and watched them play. She told the teacher that she was unhappy. When she got home from school she cried.

	A	B	C
	Probably True	Can't Tell	Probably False
1. Martha wanted to play with the other children.			
2. Martha will make friends at this school.			
3. Martha speaks English.			
4. Martha will teach the children how to play some new games.			
5. Martha stayed home from school the next day.			
6. The teacher likes Martha.			

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Mr. Edwards' farm was in the valley. He had just finished planting his seeds. He could see the snow on the mountains. He hoped the snows would not melt too fast. The fire last summer burned most of the trees on the mountainside.

	A	B	C
	Probably True	Can't Tell	Probably False
7. More water will flow into the valley this year than last.			
8. Mr. Edwards' seeds will die of frost.			
9. Topsoil from the mountain will be washed down into the valley.			
10. Mr. Edwards planted his seeds after the snow fell.			
11. Mr. Edwards will have enough water for his farm this year.			
12. Mr. Edwards' farm is on the mountainside.			

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Mr. and Mrs. Koski remembered the day they docked in New York. They had been married only two months when they arrived from Poland. America was a strange land to them. Mr. Koski worked hard for many years so his children could go to school. Ed, the oldest child, is now in college and will one day become a lawyer.

A B C

Probably True Can't Tell Probably False

13. The Koskis spoke English when they first came to America.
14. The Koskis came to America last year.
15. Ed is proud of his father.
16. The Koskis will return to Poland to live.

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Pambo is twelve years old. There are no schools where Pambo lives. He does not read or write. He fishes with his father every day. Pambo is learning to cut wood from tree bark in order to make a canoe. His father teaches him many things and is proud of how well Pambo can do them.

Tom is also twelve years old. He works hard at school and gets good grades. When he comes home from school he reads his books so that he will learn things that will help him.

A B C

Probably True Can't Tell Probably False

17. Tom is smarter than Pambo.
18. Pambo's father can read and write.
19. Pambo is having trouble learning how to make canoes.

Pambo and his family are going to move to the city where Tom lives.

20. Pambo will go fishing every day with his father.
21. Pambo will teach Tom how to make canoes.
22. Tom reads every day because he is behind in his school work.

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Henry's father is a farmer. Henry is twelve years old. During the week Henry goes to school and he wants to become a teacher. On weekends he works on the farm and has learned to drive a tractor. His father is happy that Henry wants to become a teacher.

Taro is also twelve years old. Taro's father is a hunter. Taro's grandfather also was a hunter. Taro is learning to hunt from his father. Many times on the way home from hunting Taro stops to watch the fisherman. One day Taro asked his father, "Can I become a fisherman?" Taro's father said, "No, because I am a hunter."

		A Probably True	B Can't Tell	C Probably False
23.	Henry will become a teacher.			
24.	Henry's father wants Henry to become a farmer.			
25.	Henry's grandfather was a farmer.			
26.	Taro will leave the tribe and become a fisherman.			
27.	Taro's sons probably will become hunters.			

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Three months after the Picker had been invented more flander had been picked than for all of the year before. All of the machines at the textile mills were working day and night. Six months after the Picker had been put to use the mills realized that they could not process the amount of flander sent to them.

		A Probably True	B Can't Tell	C Probably False
28.	Flander is a type of cotton.			
29.	The picker will be used only three months each year.			
30.	Flander is one of the most important products of this country			
31.	Flander is used in making cloth.			

	A Probably True	B Can't Tell	C Probably False
32. The mills will change the way they process flander.			
33. Less flander will be grown next year.			
34. The price of materials made of flander will go down.			

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Mr. Harvey spoke to the Founders Club last night. Here is part of what he said.

> "In the early days of our country many people settled here from other countries. They came here to establish a way of life that was better than they had in their own countries. They helped build a strong America because they believed in America. Today the foreigners who come here do not seem to appreciate the freedom and opportunity America offers them. We ought to be more careful about who we let in and require an oath of these foreigners before we accept them."

	A Probably True	B Can't Tell	C Probably False
35. Mr. Harvey feels that people who take an oath can be trusted.			
36. Mr. Harvey is against more people coming to America from other lands.			
37. Mr. Harvey believes the early settlers were good for America.			
38. Mr. Harvey has studied a great deal about America.			
39. Mr. Harvey believes that people born in America are more loyal than people coming from other lands.			
40. Mr. Harvey believes that there are too many foreigners in America now.			

	A Probably True	B Can't Tell	C Probably False
41. Mr. Harvey's grandfather was probably born in America.			
42. Mr. Harvey is running for political office.			

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Thirty years ago Mr. Rand bought a thousand acres of farmland. Many new industries have developed in the city nearby. About ten years ago Mr. Rand sold half his farmland to people who build homes. Last year Mr. Rand sold two hundred acres more and many homes have already been built on this land.

	A Probably True	B Can't Tell	C Probably False
43. The people are coming to work on Mr. Rand's farm.			
44. They are building houses for the people coming to work in the industries.			
45. Mr. Rand will sell the rest of his farmland to the people building homes.			
46. Mr. Rand still owns half of the farmland that he bought thirty years ago.			
47. Next year there will be more people working in industry.			
48. Mr. Rand sold his farmland for more money than he paid for it.			
49. They will need more schools.			
50. The people who had worked on Mr. Rand's farm went to work for industry.			
51. The people who bought Mr. Rand's farmland were farmers.			

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People A:

The vote had been close. A number of the representatives did not like the outcome. They decided to go back to their districts and appeal to the people for support. This was the fourth important issue on which the President had been defeated.

People B:

The Chief asked his council for advice and then he told his people what he had decided. The people listened to their Chief. When he was through talking they cheered.

A Probably True — B Can't Tell — C Probably False

52. People A and People B have the same system of government.
53. The representatives of People A are selected by the President.
54. People A will re-elect the representatives who voted for the bills the President supported.
55. People B vote on what the Chief wants to do.
56. The Chief of People B knew his people would do what he says.
57. Most of the representatives of People A agreed on the issue that they had just voted on.
58. People B vote for the members of the council.

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Mr. Jones owns a grocery store. Often, in the last few weeks, he has not had enough bread for his customers. It has been an unusually dry season in the area and the wheat crop has not done well this year.

A Probably True — B Can't Tell — C Probably False

59. The delivery trucks have broken down so Mr. Jones is unable to get bread.
60. There was as much rainfall this year as last year.
61. The bakers have been very busy this year.
62. Mr. Jones will start baking his own bread.

A Probably True   B Can't Tell   C Probably False

63. They are using the wheat to make other things this year rather than for making bread.

64. Mr. Jones will close his store until more bread is baked.

65. The wheat crop was of poor quality.

66. The price of bread is higher this year than last year.

67. Mr. Jones will make less money this year than last year.

68. More wheat will be harvested this year than last.

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APPENDIX F

ACHIEVEMENT TEST

AFRICA, AUSTRALIA AND NEW ZEALAND

Directions: Read each question carefully and think before answering. Each question has four possible choices. On your answer sheet, blacken in the letter-space which stands for the correct answer to each question. Do not write on the test booklet. If you do not know the answer to a particular question, then go on to the next question.

1. What is the largest river of western Africa?
   - A. Nile
   - B. Orange
   - C. Congo
   - D. None of the above

2. The agriculture of Australia resembles that of Europe. Many of the plants grown were originally brought as seedlings or seeds to this new land. Which conclusion below might explain why the early settlers to this land brought their own plants?
   - A. People from one area of the world cannot grow plants which are native to another part
   - B. People from one area of the world are used to certain types of plants and tend to keep that which they know near them
   - C. People who settle new areas are not interested in developing new plant types
   - D. All of the above

3. Which statement best describes the use which Africans are making of water power?
   - A. All African countries are developing water power effectively
   - B. Some countries are developing water power effectively
   - C. Most countries of Africa need to further develop their water power
   - D. All African countries are ineffective in developing water power

4. Uranium was considered rather useless during the first of this century, because few uses for it had been found. However, upon discovering that this ore could supply atomic energy, a great demand for it arose. What can be believed from these sentences?
   - A. Technology (science) creates new uses for the earth's minerals
   - B. Uranium has given wealth to Africa
   - C. Uranium is used in atomic bombs
   - D. Uranium is mined only by Belgians

5. When nations begin to become modernized, people can react in several ways. What is one way in which they usually do not act?
    - A. Become satisfied with the present situation
    - B. Become dissatisfied with the present situation
    - C. Wish to gain more freedom
    - D. Begin to demand equal job opportunities

6. What is the largest river south of the Sahara?
    - A. Nile
    - B. Niger
    - C. Orange
    - D. Congo

7. Consider today's standards. Which statement best explains how the new nations of Africa are using their skills?
    - A. The nations are not using their skills wisely
    - B. The nations are using only certain skills wisely
    - C. The nations are beginning to increase the ways to use skills
    - D. The nations are only developing the skills of certain peoples

8. The rivers of Africa have many rapids and falls along their courses. Some of the rivers in certain parts of the continent almost dry up during the dry season. What statement or principle can be made about rivers?
    - A. Rivers can aid industrial development of countries
    - B. Rivers can have great potential water power
    - C. Rivers can hinder or slow down progress of an area
    - D. All of the above

9. Considering the political developments which have taken place in Africa, what do you think the future will bring to the continent?
    - A. A stopping of new political moves
    - B. Revolution to a major section of Africa
    - C. An increased sharing by all in the government
    - D. A new emphasis of European influence

10. Ghana is in the process of development. It has employed persons from other countries to help in its development. Its various industries are receiving technical guidance and financial assistance. What principle can we draw from the above statements?
    - A. Developing nations need technical assistance as well as money
    - B. American assistance is necessary if nations are to develop
    - C. Helping fishing industries helps countries
    - D. None of the above

11. The United States never had any territories in Africa. Which statement might explain this?
    A. Citizens of a new nation, like the United States,are against taking land from other peoples
    B. A people, distant from a particular land, tend to be more concerned with things on their own continent
    C. A European people are more likely to settle foreign lands
    D. None of the above

12. If you use past standards, what statement would best describe slavery as a moral issue?
    A. Slavery was an evil which was put up with
    B. Slavery was good
    C. Slavery was not considered a moral issue
    D. Slavery was good for it brought money to the Europeans

13. From your reading what can you state about the African countries?
    A. They are all European colonies
    B. The natives are not able to govern themselves
    C. The natives are quickly becoming independent
    D. Much ill feeling exists between Europeans and native Africans

14. Most rivers flow through regions which receive fairly large amounts of rain. These rivers get their supply of water from this rain in addition to the water supplied by the river's source. However, some rivers receive the majority of their water only from their source. Which river is an example of one which receives the majority of its water from its source.
    A. Orange
    B. Niger
    C. Nile
    D. All of the above

15. New crops brought from the Americas grew very well in Africa. How could this happen?
    A. All crops can grow anywhere in the world
    B. Crops of one climate can adapt to a similar one
    C. Crops can be changed basicly to grow anywhere
    D. None of the above

16. Consider the climate of the major area of Africa south of the Sahara. Decide which statement below might describe how past Africans adapted to their surroundings?
    - A. They adapted well with elaborate houses and cities
    - B. They adapted well without any special types of dwellings
    - C. They adapted poorly for they did not develop their building skills
    - D. They adapted poorly for they did not produce large cities

17. Africa, south of the Sahara, had many craftsmen. Which craft did the region not have?
    - A. Gold craftsmen
    - B. Weavers
    - C. Wood carvers
    - D. Diamond polishers

18. What brought the Arabs to the East Coast of Africa?
    - A. The search for new land
    - B. The war-like nature of the people
    - C. The search for trading wealth
    - D. The desire to spread their culture

19. How did the Moslems of western Africa and the Africans, south of the Sahara, adapt to their surroundings?
    - A. The Moslems and other Africans adapted equally well
    - B. The Moslems adapted better to their surroundings
    - C. The Africans, south of the Sahara adapted better than the Moslems
    - D. Both groups adapted poorly to their areas

20. In Africa there were great numbers of wild animals. The presence of these wild animals influenced the ways in which the Africans got food in the past. Which statement below would best explain this influence?
    - A. It made the people of the region move a great deal
    - B. It caused the people to neglect to develop agricultural skills
    - C. It caused the people to believe in animal gods
    - D. None of the above

21. The Moslem culture considered it proper for women to be shielded from the public. Women usually were required to wear veils over their faces. In Timbuktu, women were given more rights. They could go outdoors without covering their faces and could speak with men in public. Which statement best explains why Timbuktu women had this extra freedom?
    - A. The Moslems of this city were not good people
    - B. The same culture can change from one place to another
    - C. The women would not obey the rules of the city
    - D. All of the above

22. The Sahara had an influence upon the development of the cultures of Africa. Which statement would explain this best?
    - A. The desert enabled the salt trade to develop
    - B. The desert helped to make western African culture quite different from southern African culture
    - C. The desert did not really influence the development of Africa
    - D. The desert caused the geography of the area to change

23. Large numbers of native Africans in the Union of South Africa are moving from the countryside into the cities. They are coming into the cities with the hope of finding new jobs and better living conditions. They are usually not allowed to live anywhere they wish. Many of the jobs which they engage in do not pay much money. What do you think best tells what will happen in this situation?
    - A. The native Africans will continue to live in special areas in the city
    - B. The native Africans will after awhile return to their villages
    - C. The native Africans will in time demand to be treated as equals
    - D. None of the above

24. Australia is one of the world's largest countries, but its population is very small. Much of this country is dry, and no major river systems exist. What can we believe from the above statements?
    - A. Australia lacks water
    - B. Australia's land and climate have made large parts of the land unfit for human living
    - C. Australia is having a drive on for people
    - D. None of the above are correct

25. The Dutch who first discovered New Zealand did not become interested in this land. Why?
    - A. The land was too far away from Holland
    - B. The land did not have spices
    - C. The natives were unfriendly
    - D. None of the above

26. Think about the culture of the Moslems of western Africa. Which statement best tells about these people?
    - A. These people effectively adapted to their land
    - B. These people changed all of southern Africa
    - C. These people did not adapt well to the area
    - D. None of the above

27. Which phrase best explains the statement "Water is more valuable than gold?"
    - A. Water can be sold for drinking
    - B. Water can be used for industry and agriculture
    - C. Water can be used for boat transportation
    - D. None of the above

28. What desert influenced the ways in which the people of Africa have developed?
    - A. Kalahari
    - B. Sahara
    - C. South African Desert
    - D. Lybian

29. Iron tools and weapons were valuable in the past. Which statement below would explain why?
    - A. Because they were hard to make
    - B. Because they lasted a long time and could do many jobs better than other types of tools
    - C. Because iron was hard to find
    - D. Because the metal was harder than copper

30. Consider today's standards. Which statement explains best how the Europeans treated the Africans in the past?
    - A. They treated them well
    - B. They treated them poorly
    - C. They treated them both well in some instances and poorly in others
    - D. They treated the loyal Africans well and the rebels fairly well

31. People are usually somewhat influenced by the geography around them. This does not mean that the geographic land features control them. It means that man studies where he lives and adapts in the best ways he knows. All peoples are not influenced to the same degree by the geography around them. Which group of people do you think would be under the greatest influence of the land in which they lived?
    - A. The English
    - B. The Portuguese
    - C. The Dutch
    - D. All of the above

32. The art of smelting iron from the ore was mastered in past times by many Africans. The ore had to be smelted in a blast furnace rather than in just an open hot fire. Which statement would explain why?
    - A. Ore in an open fire gets lost in the ashes
    - B. Ore needs extreme heat before it becomes iron
    - C. Ore needs to mix with charcoal in a closed furnace
    - D. None of the above

33. Diseases which the Europeans brought to Africa killed great numbers of the natives. However, even though many natives died, not many Europeans became ill and few died. Which statement best explains what happened?
    A. The Africans were weaker than the Europeans
    B. The Europeans knew how to cure disease
    C. The Europeans had had the diseases before which protected them from getting sick again
    D. The natives considered disease a curse they could not cure

34. How can a people have a history without a written language?
    A. History is the story of the past passed on by any means, oral or written
    B. History is understanding the past
    C. History is having people think about the past
    D. None of the above

35. Plant cover is strongly influenced by the type of climate which an area has. Regions which receive a great deal of rain usually support large plants and trees. Keeping this in mind, where do you think the major forests of Africa would be located?
    A. In the northern part of the continent
    B. In the southwestern section of the continent
    C. In the region near and surrounding the equator
    D. None of the above

36. Why are wool and beef the major products of Australia?
    A. There is a great demand for these products in the world
    B. The original settlers were sheep and cattle farmers
    C. The geography of the area is good for raising animals and not food farming
    D. These animals are the only ones which can be raised easily in the country

37. What two minerals have brought great wealth to South Africa?
    A. Diamonds and uranium
    B. Gold and uranium
    C. Diamonds and gold
    D. Gold and oil

38. The Australian aborigines relate stories of the past by word of mouth, for they have no written language. Traditions are told by the old people to the young people. What statement explains this situation?
    A. History can be told as well as written
    B. Old people are historians
    C. History can exist if past events are remembered by people
    D. None of the above

39. What stimulated people to go to Australia in fairly large numbers?
    - A. New and cheap land
    - B. Freedom of religion
    - C. Discovery of gold
    - D. Spice trade

40. Which statement below would you consider most nearly accurate?
    - A. The aborigines of Australia had a higher degree of culture than did the Maoris of New Zealand
    - B. The aborigines of Australia had the same level of culture as did the Maoris
    - C. The Maoris had a more complex level of culture than the aborigines
    - D. Both the aborigines and the Maoris had complex cultural ways in different things

41. Americans going to Australia and New Zealand feel quite at home because the people of these countries speak English and have similar customs. Which statement would best explain this feeling of being at home?
    - A. People don't feel strange where their language is spoken
    - B. People don't feel strange where a similar climate exists
    - C. People don't feel strange if they find people like themselves
    - D. None of the above

42. Native Africans cannot vote in the South African Parliament, yet they make up the majority of the population. Which statement best explains this situation?
    - A. Africans do not have equal rights
    - B. Africans have equal rights
    - C. The white African rulers are cruel
    - D. More information is needed to decide whether the Africans have equal rights or not

APPENDIX G

ACHIEVEMENT TEST QUESTIONS CLASSIFIED ACCORDING TO COGNITIVE EMPHASIS

Knowledge

1. What is the largest river of western Africa?
   - A. Nile
   - B. Orange
   - C. Congo
   - D. None of the above

6. What is the largest river south of the Sahara?
   - A. Nile
   - B. Niger
   - C. Orange
   - D. Congo

17. Africa, south of the Sahara, had many craftsmen. Which craft did the region not have?
   - A. Gold Craftsmen
   - B. Weavers
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18. What brought the Arabs to the East Coast of Africa?
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   - C. Discovery of gold
   - D. Spice trade

Comprehension

4. Uranium was considered rather useless during the first of this century, because few uses for it had been found. However, upon discovering that this ore could supply atomic energy, a great demand for it arose. What can be believed from these sentences?
   A. Technology (science) creates new uses for the earth's minerals
   B. Uranium has given wealth to Africa
   C. Uranium is used in atomic bombs
   D. Uranium is mined only by Belgians

5. When nations begin to become modernized, people can react in several ways. What is one way in which they usually do not act?
   A. Become satisfied with the present situation
   B. Become dissatisfied with the present situation
   C. Wish to gain more freedom
   D. Begin to demand equal job opportunities

9. Considering the political developments which have taken place in Africa, what do you think the future will bring to the continent?
   A. A stopping of new political moves
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13. From your reading what can you state about the African countries?
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27. Which phrase best explains the statement "Water is more valuable than gold?"
A. Water can be sold for drinking
B. Water can be used for industry and agriculture
C. Water can be used for boat transportation
D. None of the above

Application

2. The agriculture of Australia resembles that of Europe. Many of the plants grown were originally brought as seedlings or seeds to this new land. Which conclusion below might explain why the early settlers to this land brought their own plants?
A. People from one area of the world cannot grow plants which are native to another part
B. People from one area of the world are used to certain types of plants and tend to keep that which they know near them
C. People who settle new areas are not interested in developing new plant types
D. All of the above

8. The rivers of Africa have many rapids and falls along their courses. Some of the rivers in certain parts of the continent almost dry up during the dry season. What statement or principle can be made about rivers?

A. Rivers can aid industrial development of countries
B. Rivers can have great potential water power
C. Rivers can hinder or slow down progress of an area
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6

10. Ghana is in the process of development. It has employed persons from other countries to help in its development. Its various industries are receiving technical guidance and financial assistance. What principle can we draw from the above statements?
    - A. Developing nations need technical assistance as well as money
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Analysis

22. The Sahara had an influence upon the development of the cultures of Africa. Which statement would explain this best?

A. The desert enabled the salt trade to develop
B. The desert helped to make western African culture quite different from southern African culture
C. The desert did not really influence the development of Africa
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   D. More information is needed to decide whether the Africans have equal rights or not

Synthesis

11. The United States never had any territories in Africa. Which statement might explain this?
   A. Citizens of a new nation, like the United States, are against taking land from other peoples
   B. A people, distant from a particular land, tend to be more concerned with things on their own continent

C. A European people are more likely to settle foreign lands
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41. Americans going to Australia and New Zeland feel quite at home because the people of these countries speak English and have similar customs. Which statement would best explain this feeling of being at home?
    A. People don't feel strange where their language is spoken
    B. People don't feel strange where a similar climate exists
    C. People don't feel strange if they find people like themselves
    D. None of the above

Evaluation

3. Which statement best describes the use which Africans are making of water power?
    A. All African countries are developing water power effectively
    B. Some countries are developing water power effectively
    C. Most countries are ineffective in developing water power
    D. All African countries are ineffective in developing water power

7. Consider today's standards. Which statement best explains how the new nations of Africa are using their skills?
    A. The nations are not using their skills wisely
    B. The nations are using only certain skills wisely
    C. The nations are beginning to increase the ways to use skills
    D. The nations are only developing the skills of certain peoples

12. If you use past standards, what statement would best describe slavery as a moral issue?
    - A. Slavery was an evil which was put up with
    - B. Slavery was good
    - C. Slavery was not considered a moral issue
    - D. Slavery was good for it brought money to the Europeans

16. Consider the climate of the major area of Africa south of the Sahara. Decide which statement below might describe how past Africans adapted to their surroundings?
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    - A. The Moslems and other Africans adapted equally well
    - B. The Moslems adapted better to their surroundings
    - C. The Africans, south of the Sahara adapted better than the Moslems
    - D. Both groups adapted poorly to their areas

30. Consider today's standards. Which statement explains best how the Europeans treated the Africans in the past?
    - A. They treated them well
    - B. They treated them poorly
    - C. They treated them both well in some instances and poorly in others
    - D. They treated the loyal Africans well and the rebels fairly well

40. Which statement below would you consider most nearly accurate?
    - A. The aborigines of Australia had a higher degree of culture than did the Maoris of New Zealand

B. The aborigines of Australia had the same level of culture as did the Maoris
C. The Maoris had a more complex level of culture than the aborigines
D. Both the aborigines and the Maoris had complex cultural ways in different things

APPENDIX H

SMALL CONTRACT PROPOSAL

The small contract proposal is included in this report at the request of the U. S. Office of Education, San Francisco District Office, in order to provide guidance to persons in the process of writing such proposals.

SMALL CONTRACT PROPOSAL

Submitted to the U. S. Commissioner of Education
Under the Provisions of Public Law 531

Project Title : The Influence of Analysis and Evaluation Questions on Achievement and Critical Thinking in Sixth Grade Social Studies

Submitted by : College of Education
University of Washington
Seattle, Washington 98105

Principal Investigator :
Francis P. Hunkins, Ph. D.
Assistant Professor of Education
University of Washington
206-543-1847

Transmitted by :
George Farwell, Ph. D.
Assistant Vice President
203 Administration Building
University of Washington
Seattle, Washington 98105
206-453-0151

Contracting Officer :
William C. Erskine
Comptroller
200 Administration Building
University of Washington
Seattle, Washington 98105
206-543-4990

Duration of Activity : November , 1966 - October 31, 1967

Total Federal Funds Requested :

Date Transmitted : September 12, 1966

I. Abstract

Objectives

This study seeks to determine whether a dominant use in social studies text materials of analysis and evaluation questions, as defined by Bloom's Taxonomy, will effectively stimulate the development of pupils' critical thinking in sixth grade social studies. The study also wishes to discover if an emphasis on these types of questions will improve the social studies achievement of these pupils.

Procedure

The sample selected will be twelve sixth grade social studies classes from a large suburban public school system. The twelve classes will involve approximately 320 pupils. Materials will be constructed for two treatments: 1) Condition A-, a dominant emphasis on analysis and evaluation questions, 2) Condition B-, a dominant emphasis on knowledge questions. These materials will be used with the regular classroom social studies textbook. The experiment will be conducted over a one-month period. Both a pre- and post-test of critical thinking and social studies achievement will be administered to the pupils.

Pupils' IQ scores and pre-tests (Critical thinking and achievement) will be analyzed by ANOVA techniques. If significant differences are obtained, these scores (IQ, pre-critical thinking and pre-achievement) will be used as covariants on subsequent analyses of the criterion data. Within each condition, obtained data will be analyzed according to sex and level of reading achievement.

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II. Problem

This study proposes to investigate the influence of analysis and evaluation questions upon the social studies achievement and critical thinking skills of sixth-grade pupils.

In the planning of lessons, educators suggest that desired instructional objectives be stated in behavioral terms and the means to achieving these objectives be made clear. Questions in teacher-talk and instructional materials are significant in guiding the teaching-learning situation toward achievement of objectives. Questions which teachers ask reveal stated or unverbalized objectives stressed, for example, increasing pupils' knowledge of facts; increasing pupils' understandings, concepts, increasing pupils' skills at interpreting materials. From current research, it appears that the emphasis of teachers' questions is on knowledge of facts. Pupils' questions, moreover, relate to pupils' perception of the teacher's emphases. Probably rarely would a teacher carefully contemplate the wording and emphasis of a question; the question usually has a spontaneous birth in the atmosphere of classroom discourse. This lack of pre-planning of questions is not true in the writing of instructional materials. Questions in textbooks are, or at least should have been, planned by the writers. But, even so, the emphasis of questions in these materials appears to be overwhelmingly on knowledge of facts.

Schooling is developed and planned in order that both ideas may be developed and that thinking be stimulated. Acquisition of knowledge is necessary, but it must be accompanied by thinking if wisdom is to be attained. To implement the goal of fostering the development of thinking, "realizable" teaching strategies and specially prepared materials must be available to pupils. Simply to discuss this objective in vague terms is not only meaningless, it is non-productive. The social studies, because of its basic accepted aims and its history is an appropriate vehicle in which teaching strategies can be employed to stimulate thinking and understanding.

The usefulness of questions has been long recognized as significant in making effective the teaching-learning situation. However, attention to specific types of questions and their results, for the most part, has been neglected. This proposed study will investigate primarily three types of questions based on the critierion categories of Bloom's Taxonomy: knowledge questions, analysis questions, and evaluation questions. The first type of question emphasizes the recall of ideas, materials, or phenomena. It calls for a releasing of certain information "stored" in the individual's memory. Analysis questions emphasize the arranging and rearranging of information into elements, relationships, and organizations. The last type of question considered, evaluation, requires the use of criteria and standards in order that a judgment may be made in regard to which information is accurate, effective, economical, or satisfying. These two latter categories subsume the presence of knowledge. This Taxonomy, which has appeared only within the last decade, is a design which is useful in guiding construction of questions with various emphases (Bloom, 1956).

This study proposes to use particular types of questions (specifically, "analysis" and "evaluation") to stimulate critical thinking. Critical thinking in this study refers to the skills of 1) identifying central issues, 2) recognizing underlying assumptions, 3) evaluating evidence or authority and 4) drawing warranted conclusions (Chausow, 1965). The first three skills can be subsumed under what Taba (1964) calls "discrimination," the last skill can be considered the same as her category labeled "inference."

Specifically, are questions requiring "analysis" and "evaluation" helpful in promoting critical thinking in the social studies? Does an emphasis on such questions lead to increases in pupils' social studies achievement? Presently, research results are insufficient to answer these questions. Such information is essential if schools are to give substance to the aim of promoting pupils' thinking.

III. Related Research and Pertinent Literature

Over fifty years ago, Stevens (1912) noted a dominant emphasis on memory questions in both English and social studies classes with social studies sections stressing this type of question more. Consequently, Stevens called for intelligent use of questions as instructional devices and stated that questions should stimulate reflective thought in addition to mere memorization of facts. Stevens' plea has been greatly ignored. Questioning, an important feature of the teaching act and of instructional materials, has not been singled out for the attention it deserves, either in research or in speculation.

Recently, however, interest has been revived concerning questions in the instructional context. The concern is with 1) teachers' classroom questions and 2) attention to employing questions to develop children's thought processes. For example, Floyd (1960) studied questions asked by primary teachers and concluded that there existed a poor balance of question types with memory questions dominating the class activity. Adams (1964), developing a system of categories by which he classified the questions asked by secondary school English and social studies teachers, discovered a similar dominating emphasis of memory questions although the overall proportion, when compared with Stevens' study (1912), was less. However, Adams noted that social studies teachers still asked more memory questions than did English teachers. Even so, the overall emphasis on memory questions proved memory to be still the cognitive objective receiving the most emphasis in the teaching situations of both groups of teachers.

In this recent growth of interest in questions, perhaps Suchman's (1958) technique of inquiry training has commanded the most attention. However, his procedure does not specify the exact types of questions pupils ask, or should ask, nor does it deal directly with the nature of teachers' questions. In fact, Suchman sheds no light upon the effectiveness of the types of questions in his inquiry training procedure. Other educators, however, have dealt, in some degree, with this crucial problem of form and type of question. Blank (1963) for instance, studying inquiry training within the medium of programmed instruction, required children to ask questions about the relevant dimensions of problems prior to attempts at solution. His study revealed that pupils, when experiencing this focus on questions asked significantly more questions on both oral and written criterion tests and participated more in class discussions with no detriment to class progress. On the other hand, Herrick (1962) concluded that the use of questions with emphasis—on relevant dimensions of problems prior to solution produced no significant increases in either rate or amount of learning. Tangentially related to these findings are those of Vuke (1962) who studied the placement of questions in filmed materials and found that the inclusion of questions in these materials gave inconclusive results as to growth in knowledge. Even though questions are being emphasized in research and educational literature, no attention is being given to the cognitive processes which questions might stiumulate.

While a paucity of educational research dealing specifically with questions is evident, numerous articles, speeches and books have exhorted the merits of the question as a device of effective teaching.

For example, Loughlin (1961) stated that effective questioning is effective teaching. Klebaner (1964) adds agreement to Loughlin's claim by stating that the carefully thought out question used effectively is vital to achieving the purposes of education. Wellington and Wellington (1962), while differing in their definition of teaching, advocate more effective use of questions in the teaching situation. Teaching, they stress, is not the teacher asking questions, but rather the teacher guiding the pupils so that they ask effective questions. Carner (1963) took somewhat the same emphasis in stating that teachers must be cognizant of the types of thinking required before they can frame effective questions to assist children in such cognitive development. Teachers need to be aware of the level, concrete or abstract, of questions which is most suited to a particular learning situation. Carner stated that present teacher-emphasis is on questions which are supported by facts. He does mention in some detail what cognitive skills could or should be nurtured by questions. Carner also advocated that children need to have the ability to question themselves independently about the materials with which they deal.

Burton (1929, 1944) presented some general principles basic to good questioning in attempts to draw teacher-questioning away from the specific-fact emphasis. More recently, Aschner (1961) urged that questions should be used to "trigger" thinking in addition to recalling specific facts. Additional suggestions for effective use of questions have been offered, e.g. (Philip Smith, 1961; Struck, 1962). This attention, although useful, nevertheless seems to fail to provide the insight necessary for improving questioning, for most times the information and suggestions are based upon philosophical and pedagogical assumptions rather than on the results of empirical research.

Guides to effective questioning in the classroom should also assist in improving questions in instructional materials. But, because of the general absence of exemplars, the quality and effective utilization of questions in textbooks has been assumed and not examined. Only a few investigations have directed attention toward questions in instructional materials. Washburne (1929) and Golden (1943), for example, studied the effects of placement of questions in materials, only to have their efforts produce contradictory results. Washburne concluded that the optimal placement of questions with regard to recalling facts and making generalizations in social science was at the beginning of the material. Golden, on the other hand, found that the best placement of questions was at the end of material presentations. Several individuals have studied the nature of the textbook question. Cunningham (1925) and Curtis (1943) noted that in textbooks, there existed an overbalance of questions requiring simple recall and memorization. Davis and Hunkins (1965), studying the questions in three elementary school social studies textbooks, using Bloom's Taxonomy as a criterion, noted an overwhelming emphasis on knowledge of specific facts. Pfeiffer and Davis (1965), using the same criterion, discovered a similar emphasis in questions in teacher-made tests. Eaton (1964) studied questions from the standpoint of number in text materials with regard to effectiveness in stimulating science achievement and favorable attitudes toward science. He compared number of questions with number of activities and number of incongruities. His conclusions raised doubt as to whether questions in the text narrative could be considered an optimal means for stimulating intellectual skills, achievement and attitude development. However, Eaton's findings should not be acted upon prematurely, for he only considered the number of questions to the neglect of their cognitive emphasis.

That questions should be utilized to stimulate thinking, critical thinking in particular, has been directly stated or implied in much educational discussion and research. Numerous studies and reviews of studies have considered critical thinking within the context of the social studies (Rothstein, 1960; McGarry, 1961; Cox, 1963; Elsmere, 1963; and Cousins, 1963). Most research on critical thinking within the social studies has focused on increasing this skill without contributing to a decrement in achievement. Questioning, a significant feature of the teaching technique in these studies, has not been examined specifically and has been confounded with other instructional variables to the extent that few, if any meaningful generalizations about the effects of particular types of questions and questioning can be made with assurance.

Some recent, general studies of the teaching act have considered questions and questioning as elements of the total classroom discourse, but this research, being general, provides no insight on question types and their effects (Aschner and Gallagher, 1961; Aschner, 1959; B. O. Smith, 1962; Flanders, 1962; Hughes, 1959; Kean, 1965).

Only Taba (1964) has proposed specific teaching strategies employing questions in the development of thinking. She concluded that data discrimination is a skill which is prerequisite to performing the more sophisticated operations of inference making. Strategies utilizing questions emphasizing specific facts first and then proceeding to higher-level questions seemed to produce an effective and persistent raising of thought to higher levels. Her conclusions were offered, essentially, as hypotheses for future research.

In all of the research concerned with questions, thinking, and teaching, each researcher has devised unique criterion measures. Somewhat surprising is that the Taxonomy of Educational Objectives: Cognitive Domain (Bloom, 1956) in existence for nearly a decade, has so seldom been employed as a guide for teacher questions. Although Jarolimek (1962) suggested several uses of the Taxonomy, only a few studies have used the Taxonomy as a research tool (Sanders, 1965; Davis and Hunkins, 1965; Pfeiffer and Davis, 1965). Nevertheless, the Taxonomy currently is being subjected to intensive research and receiving general attention (Ellis, 1963; Elliott, 1965; Klein, 1965; Stoker and Kropp, 1964; R. B. Smith, 1965; R. B. Smith and Paterson, 1965; and Lombard, 1965). The Taxonomy has hierarchically-arranged categories: knowledge, comprehension, application, analysis, synthesis, and evaluation. The categories of analysis and evaluation seem to be directly related to critical thinking, and instructional questions with these emphases should stimulate such thinking. At present, this assumption lacks research support. The time is propitious to investigate the impact of specific kinds of questions on the development of pupils' thinking.

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IV. Objectives

The major objective of this study is to determine whether sixth grade pupils using text-type materials employing a dominant use of analysis and evaluation will manifest greater increase in critical thinking ability and social studies achievement than sixth grade pupils using text-type materials employing questions which emphasize recall of knowledge. This achievement will be considered in relation to pupils' sex and reading level.

Throughout this study, "knowledge" questions are those which demand the recall of factual material from memory. "Analysis" questions are those which demand the pupil to break down material to reveal elements, relationships and organizational principles. The final major type of question, "evaluation," refers to a question which demands judgments about value, effectiveness, or goodness of some situation or phenomena in relation to some standard or norm. Bloom's Taxonomy will serve as the criterion for these question types.

The hypothesis to be tested, stated in null form is listed below:

Use of text-type materials employing questions requiring "analysis" and "evaluation" does not result in differences in sixth grade pupils' critical thinking and social studies achievement when compared with the use of text-type materials incorporating questions requiring the recall of knowledge in relationship to a) pupils' reading level,

b) sex, and c) the interactions between these variables.

V. Procedure

Subjects. Twelve sixth grade social studies classes will be selected from a large suburban public school system. The twelve classes will enroll approximately 350 pupils. This number of pupils will provide an acceptable minimum number in each cell of the analytic design. Consequently, the subjects in this study constitute a sample from a larger theoretical population like them. Thus generalizations will be limited by this consideration.

All teachers will participate in the study on a voluntary basis. Classes will be assigned at random to the treatments: six classes to Condition A (dominant emphasis on analysis and evaluation questions) and six classes to Condition B (questions emphasizing knowledge). Approximately one hundred and seventy-five pupils will be in each treatment.

Since no previous studies have been concerned with this particular problem, any grade level could have been chosen for investigation. The major reasons for choosing the sixth grade were that the investigation was feasible at the intermediate level and was "most doable" at the sixth grade.

Instruments and Experimental Design. Pupils reading achievement from the Stanford Achievement Test (Form W) and intelligence quotients from the California Test of Mental Maturity (Short Form) will be obtained in advance of the experiment. These tests are elements of the comprehensive testing program of the participating school system. The Scoial Studies Inference Test (I. T.) (Taba, 1964) will be used as the criterion test of critical thinking and will be administered prior to and following the experimental treatment. This test was designed to measure four aspects of critical thinking: discrimination, inference, caution, and over-generalization. Odd-even reliability coefficients (at $P < .01$) for this test at the sixth grade level were reported to be: inference, .87; discrimination, .68; caution, .89; and over-generalization, .71. A criterion test of achievement covering the selected social studies unit will be constructed by the investigator. This forty-two item, multiple-choice test will contain an equal number of test items (7) emphasizing each category in Bloom's Taxonomy. Each item will be analyzed by a jury well acquainted with the Taxonomy to determine if the item has the intended emphasis. Reliability will be determined using appropriate techniques. This criterion achievement test also will be given prior to and following the experimental treatment.

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The experimental treatment will be in effect for a one month period. This time length was selected in order that it would approximate the duration of the average social studies unit. The treatment will involve a major segment of each daily fifty minute social studies period.

Pupils in both experimental treatment conditions will use the standard social studies text adopted by the cooperating school system, The Changing Old World (Cooper, Sorensen, and Todd, 1961). For each treatment, a set of special worksheets for the group in Condition A will incorporate questions with a dominant emphasis (a range from 40 to 50 per cent) in the Bloom's Taxonomy categories of analysis and evaluation. The remaining questions will be roughly equally divided among the other four categories in the Taxonomy. Condition B's worksheets will contain a dominant emphasis on knowledge questions (90 per cent). The number of questions in Conditions A's and B's worksheets will be approximately similar, and the question order for both worksheets will be random. The cognitive emphasis of each question in the worksheets will be evaluated by a jury experienced with the Taxonomy.

The worksheets for both groups will be identical in format and directions. The only varying factor will be the different question emphases. The pupils will have space on these worksheets on which to write their responses to their questions. Pupils, in both conditions, in several class periods prior to the experimental treatment, will be familiarized with the use of the experimental worksheets.

After completion of the worksheet activity, pupils will be given answer sheets which will provide immediate feedback of possible answers. These answer sheets will make possible pupils' evaluation of their own work and also an additional opportunity for learning from the questions with which they have dealt.

One half hour will be devoted to pupil work with the worksheets and answer sheets during each daily social studies period. During this time, the teacher will not assist any pupil in interpreting directions or questions. For pupils who cannot understand a question or a direction, the teacher may ask him to write on the worksheet what he thinks the question or direction means and deal with it accordingly. Students who finish early will be allowed to work on class projects or engage in independent reading. The remaining time of the period, after the half hour, may be utilized by the teachers in activities appropriate to the unit of study such as pupil reports, construction of dioramas and bulletin boards, and independent reading.

At no time will the teachers engage in a discussion of the materials nor will they allow additional time for pupils to work on the materials. Also, pupils will not be allowed to take the worksheets home, and previews of future worksheets will not be allowed. No marks (grades) will be given for these worksheets, and they will not be returned to the pupils after the completion of the lesson. Marks will be given for the post-achievement test, and the children will be informed of their scores. Participating teachers will distribute and collect the experimental materials and administer the various tests. The teachers will undergo a training period in order that all tests will be administered in an identical manner.

These worksheets represent an attempt to simulate a crucial aspect of teachers' behavior--asking questions. By using the medium of the worksheets, questions will be more closely controlled, and consequently, generalizations about the effects of these types of questions may be made with a greater degree of accuracy. However, to be underscored is that this study is a primary investigation, an exploratory study into an area not previously researched. The purpose of this study is not to provide evidence for sweeping generalizations, but rather to open up an entire area of research with a rather precise and limited foundation.

The experimental design basic to this study is an analysis of variance design. Within each condition, obtained data will be analyzed according to sex and reading achievement. This will result in a 2 x 2 x 4 (treatment x sex x reading level) classificatory scheme. From this design other schemes will be generated if needed.

c	SEX							
b	Male				Female			
	Reading Level				Reading Level			
a	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Treatment A								
B								

Pupils will be assigned to reading levels according to quartile ranks as determined by their scores on the reading test employed.

The design also can be schematically shown as follows:

$$R \quad \begin{array}{cccl} Y_b & X_1 & Y_a & \text{Condition A} \\ \hline Y_b & X_2 & Y_a & \text{Condition B} \end{array}$$

where X_1 equals the conditions with dominant emphasis on analysis and evaluation questions; X_2 represents the condition with dominant emphasis on knowledge questions. Y_b represents the pre-tests (both critical thinking and social studies achievement) and Y_a represents post-tests (both critical thinking and social studies achievement. R represents the random assignment of pupils (within class groups) to the treatments.

Pupils' IQ scores and pre-tests (I. T. and achievement) will be analyzed by ANOVA techniques. If significant differences are obtained, these scores (IQ, pre-I. T. and pre-achievement) will be used as covariants on subsequent analyses of the criterion data.

Analyses. Analysis of variance techniques will constitute the basic statistical treatment. Other methods of analysis will be employed as appropriate and necessary. These other methods will include *t* tests, correlational analysis, and non-parametric techniques.

Approximate time schedule. The schedule for this study will follow the approximate time sequence indicated.

Arrangements - December 1965 - February 1966
Preparation of Criterion Tests and Experimental
Materials - January - March 1966
Experiment - April 1966
Data Collection - March - May 1966
Analysis of Data - June - August 1966
Preparation of Final Report - March 1967

Expected End-Product. A detailed final report will be prepared and submitted at the termination of the project. In addition, articles will be written for appropriate scholarly journals. The materials prepared and data obtained also may be used in other studies. Also, the data may serve as a stimulus for study of teacher's use of questions in the classroom.

VI. Personnel

The principal investigator for this project will be Dr. Francis P. Hunkins whose areas of expertise are curriculum and instruction and social studies education. Dr. Hunkins also has a minor in the area of geography. Before receiving his doctorate in 1966, he served as a research assistant for three years at the Bureau of Educational Research, Kent State University, Kent, Ohio, and was a project assistant with Dr. O. L. Davis, Jr. in the USOE Cooperative Research Project, "The Usefulness of Graphic Illustrations with Text in Promoting Pupil Learning in the Social Studies" (Project No. 2101). Dr. Hunkins' major professional interests are social studies education, curriculum theory and development, and improvement of instruction. He obtained his B.S. in Education from Salem State College, Salem, Massachusetts, with majors in elementary education and English. His M. Ed. was obtained from Boston University with emphases on elementary education and social studies. Prior to receiving his master's degree, he taught in the fifth grade.

Dr. Hunkins' research experience includes his master's thesis which dealt with the stimulation of critical thinking in fifth grade children. He also participated in several projects at the Bureau of Educational Research at Kent State University. The projects have acquainted him with the areas of concept development in young children, the effectiveness of graphic illustrations, and the utilization of Bloom's Taxonomy.

Dr. Hunkins is presently employed by the University of Washington, College of Education and teaches courses in the areas of social studies and curriculum and instruction.

He currently holds membership in the following professional organizations: American Educational Research Association, Association for Supervision and Curriculum Development, National Society for the Study of Education, National Council for the Social Studies, Association of American Geographers, American Geographical Association, Phi Delta Kappa, Washington ASCD and American Association of University Professors.

Publications which are most pertinent to the proposed study follow:

1. Hunkins, Francis P. "Using Questions to Foster Pupils' Thinking." Education, in press.

2. Hunkins, Francis P., and Pfeiffer, Isobel, "Bloom's Taxonomy: A Stimulus to Better Teaching" Ideas Educational 3:11-17; Spring 1965.

3. Hunkins, Francis P., and Shapiro, Phyllis. "Teaching Critical Thinking in Elementary School Social Studies Through A Case Method Procedure." *Education*, in press.

4. Davis, O. L., Jr., Hunkins, Francis P. "Textbook Questions: What Thinking Processes Do They Foster?" *Peabody Journal of Education*, March, 1966.

5. "Bloom's *Taxonomy* as a Test Construction Guide." *Ideas Educational*. 4:13-16, March 1966.

A major consultant for the project will be Dr. O. L. Davis, Jr., Associate Professor of Education at the University of Texas, Austin, Texas. Dr. Davis has done research within the framework of the social studies. Also serving as consultants will be Dr. Karou Yamamoto, Associate Professor of Educational Psychology, University of Iowa; Dr. David Turney, Professor of Education and Dean of the College of Education, Indiana State University; Dr. Philip Merrifield, Associate Professor of Education, and Director of the Bureau of Educational Research, Kent State University; Dr. Jordan Hodgkins, Professor and Chairman, Department of Geography, Kent State University; and Dr. James H. Rodabaugh, Professor of History, Kent State University.

VII. Facilities

The College of Education, University of Washington, will serve as the major support center for this investigation. The College has available desk calculators and secretarial facilities are available at the University. The area supports several university libraries, the largest being at the University of Washington, and the city library and its various branches where professional references may be obtained. Appropriate consultants are available from the University if needed.

VIII. Other Information

No financial support is available for this project from any other source, nor has this proposal been submitted in any form to any other agency or organization. The proposed project is not an extension or an addition to a previous project supported by the Office of Education. No similar or related project, to the author's knowledge, has been previously submitted to the Office of Education.

APPENDIX 1

Condensed Version of the Taxonomy of Educational Objectives

Cognitive Domain

KNOWLEDGE

1.00 KNOWLEDGE

INTELLECTUAL ABILITIES AND SKILLS

2.00 COMPREHENSION

3.00 APPLICATION

4.00 ANALYSIS

5.00 SYNTHESIS

6.00 EVALUATION

APPENDIX 2

Below are specimen items from the achievement test to be used as a criterion measure. The items represent each of the categories as found in Bloom's Taxonomy.

1. (1.00) What two minerals have brought great wealth to South Africa?

   A. Diamonds and uranium
   B. Gold and uranium
   C. Diamonds and gold
   D. Gold and oil

2. (2.00) Which phrase best explains the statement "Water is more valuable than gold?

   A. Water can be sold for drinking
   B. Water can be used for industry and agriculture
   C. Water can be used for boat transportation
   D. None of the above

3. (3.00) Large numbers of native Africans in the Union of South Africa are moving from the countryside into the cities. They are coming into the cities with the hope of finding new jobs and better living conditions. They are usually not allowed to live anywhere they wish. Many of the jobs which they engage in do not pay much money. What do you think best tells what will happen in this situation?

   A. The native Africans will continue to live in special areas in the city
   B. The native Africans will after awhile return to their villages
   C. The native Africans will in time demand to be treated as equals.
   D. None of the above

4. (4.00) Native Africans cannot vote in the South African Parliament, yet they make up the majority of the population. Which statement best explains this situation?

   A. Africans do not have equal rights
   B. Africans have equal rights
   C. The white African rulers are cruel
   D. More information is needed to decide whether the Africans have equal rights or not

5. (5.00) Americans going to Australia and New Zealand feel quite at home because the people of these countries speak English and have similar customs. Which statement would best explain this feeling of being at home?

   A. People don't feel strange where their language is spoken
   B. People don't feel strange where a similar climate exists
   C. People don't feel strange if they find people like themselves
   D. None of the above

6. (6.00) Consider today's standards. Which statement explains best how the Europeans treated the Africans in the past?

   A. They treated them well
   B. They treated them poorly
   C. They treated them both well in some instances and poorly in others
   D. They treated the loyal Africans well and the rebels fairly well

APPENDIX 3

This appendix gives two representative examples of the materials to be employed in this investigation. The materials are for the two conditions A and B. The A Condition materials were numbered in the upper right-hand corner of the sheets, and the B Condition materials were numbered at the bottom-center of each page in order to facilitate proper identification by the investigator. Worksheet III, Section 5 materials are for Condition B. Condition A is represented by Worksheet IV, Section 5 materials.

Name____________________________

Worksheet III
Section 5

CHANGES SOUTH OF THE SAHARA

Directions: This section covers the material from page 425, "South Africa's cities" to the end of page 429. The questions on page 430 you are not to do during this worksheet period, for they have already been considered in the section materials given you. Think before you answer each question. You have from twenty to twenty-five minutes to work with this worksheet. When you have finished, get an answer sheet and correct your work.

1. What is the climate of Kenya like?

2. For what is sisal used?

3. What crops did the British grow in the highland area of Kenya?

4. When did Ghana become a republic?

Worksheet III, Section 5

5. By what name was Ghana previously known?

6. When were some of Kenya's African population given the right to vote?

7. What is the major river of the Union of South Africa?

8. What items contribute to Ghana's economy?

9. What are some of the jobs which the native Africans do in Kenya?

10. What is the capital city of Kenya?

11. When did Ghana become independent?

Worksheet III, Section 5

12. On page 429 is the statement " . . . it will take more than modern buildings to make a modern nation." What does this statement mean?

13. What is the largest city of the Union of South Africa?

14. What is the most important city on the east coast of the Union of South Africa?

15. What resource has made it possible for the Union of South Africa to have factories that produce tools, machines, and railroad equipment?

16. What wealth from the ground does Ghana hope to develop more fully in the future?

17. What are the two cities in the Union of South Africa where government activities are carried on?

18. How did the British develop Kenya?

Worksheet III, Section 5

19. What has been the major industry of Johannesburg?

20. Discuss the biggest problem which the Union of South Africa has today?

21. Describe the landscape of Ghana?

22. The Union of South Africa is larger than either France or Germany. Do you think it could support as many people as either of those countries? Explain your answer.

23. Where is Kenya located?

ANSWER SHEET FOR WORKSHEET III, Section 5

CHANGES SOUTH OF THE SAHARA

Directions: This answer sheet is to be used by you to correct your work. It is made to assist you in your learning. Some answers have single words; others have groups of words; others have sentences. Your answers may not be exactly worded the same as on this answer sheet, but if they have the same general idea, you may count them correct.

1. The climate of Kenya has hot days and cool nights. The climate is influenced by the highlands. There are two rainy seasons, but no month goes completely without rain.

2. For making rope.

3. Grain, coffee, tea, sisal.

4. In 1960.

5. Gold Coast.

6. In 1960.

7. Orange River.

8. Forest products, farm products, mining products, especially bauxite.

9. Work on European farms, work in cities, work in mines. You may have other reasons, good.

10. Nairobi.

11. In 1957.

12. The statement "it will take more than modern buildings to make a modern nation" means that a nation must be made up of people, not only buildings. The people of the area must think of themselves as being members of a particular country, rather than of particular tribes. One must have this national feeling, otherwise, buildings will only be things to look at, not structures of a particular country.

Answer Sheet for Worksheet III, Section 5

13. Johannesburg.

14. Durban.

15. Iron.

16. Bauxite ore, aluminum ore.

17. Capetown and Pretoria.

18. The British developed Kenya in many ways. They brought modern medicine into the country. This helped the population to increase and to become healthy. The British built railroads and roads which made it possible to transport goods from one part of the country to another. The British developed industry in the country.

19. Gold mining.

20. The biggest problem which the Union of South Africa has today is one of allowing the native Africans, black Africans, and Indians of the country to have some voice in the government. The white rulers of the country feel that the progress of the country would go backward if they let the Africans have an equal voice in the government. Besides, the majority of people are black Africans, and so even with just one vote each, they could easily outvote the whites. The continent of Africa is seeing a lot of change with regard to who rules the various countries, the black Africans or the white Africans. The black Africans are not content to be ruled by the whites. The whites are fearful of black African rule.

21. Ghana is a land of rolling plains and low plateaus. Ghana has grasslands in the north and tropical forests in the south.

22. If your answer is yes, you may have the following reasons to explain it.

    The Union of South Africa has a larger area and has enough natural resources to support a larger population. Modern technology could be and is being developed to give more people jobs.

    If your answer is no, the following reasons will explain it. The area of the country is much too dry to support enough agriculture or industry necessary for additional people. Not enough minerals for more industry are present.

23. In eastern Africa.

Name__________________________

Worksheet IV
Section 5

PAST AND PRESENT IN AUSTRALIA AND NEW ZEALAND

Directions: This section covers the material in your textbook from page 448, "Australia's mines and factories" to the end of page 450. The questions on page 451 are not to be done during your working period, for they have been considered in the section materials. — Think carefully before answering each question in the spaces provided. You have from twenty to twenty-five minutes to work with this worksheet. When you have finished, get an answer sheet and correct your work.

1. What is the largest city of New Zealand?

2. Do you think that the New Zealand dairy industry is modern and efficient? Explain your thinking?

3. Why do you suppose the dairy industry is a major one in New Zealand?

4. Iron and coal are important minerals for Australia. Why are they considered important?

5. Australia has limited the number of people from Asia, Asians, who can make their homes in Australia. Do you think this is a just and fair policy?

Worksheet IV, Section 5

6. From reading this section on Australia and New Zealand, do you think the author presents enough material on these two countries to give you, the reader, a good understanding of these two lands? Explain your answer.

7. Most of the people of New Zealand live on North Island. Why do you think this is so?

8. New Zealand has been called the "most English" of all the Commonwealth countries. Can you think of reasons why this country should have "English" characteristics?

9. Do you think that the present forest policy of the New Zealand government is a wise one? Explain your thinking.

10. Why does Australia have so few people when it has so much land?

11. What is the capital of New Zealand?

ANSWER SHEET FOR WORKSHEET IV, Section 5

PAST AND PRESENT IN AUSTRALIA AND NEW ZEALAND

Directions: This answer sheet is to be used by you to correct your work. It is made to assist you in your learning. Some answers have single words; others have groups of words; others have sentences. Your answers may not be exactly worded the same as on this sheet, but if they have the same general idea, you may count them correct.

1. Auckland.

2. Yes is the best possible answer to this question. The dairy farms have modern, up-to-date equipment. Tractors and other mechanical equipment is used. Airplanes have even been used in some instances to scatter seed and fertilizer. The land is effectively used to grow livestock feed. One gets the idea from reading that other scientific study is being carried on which will make the dairy industry even more efficient and modern.

3. The dairy industry is a major one in New Zealand for large areas of the country are grassland, and the climate is good for raising dairy cattle. New Zealand finds that with modern refrigerator ships, it can find a ready market for dairy products in the world, especially England.

4. Iron is important because most other heavy industries need iron and steel with which to build and manufacture other goods. Coal is needed in the process of making iron into steel. By having these two minerals, Australia can more easily build up its industries and make ships, buildings, and other heavy equipment necessary for a modern nation. You may have had other reasons, good.

5. There are two possible answers. No is perhaps the best answer.

   No, this policy is not fair. The opportunities for admittance are made in favor of the Europeans, not the Asians. All peoples, if they pass certain qualifications and wish to go to Australia, should be admitted. If they are kept out, it should not be based on race. Such a ruling is showing prejudice. Such a law does not recognize that all races are basically the same in potential ability.

Answer Sheet for Worksheet IV, Section 5

If your answer was yes, the following reasons might have been given to defend your view. Australia belongs to the Australians. They are the ones who should decide who they want to have in their country. Most other countries do this, even the United States. It does no harm to the Asian people. It helps to allow only the best people to come into the country.

6. Again, there are two possible answers to the question.

The best possible answer is no. The author did not give enough information concerning these countries to allow the reader to arrive at a detailed understanding of these areas. The material on these areas is not as complete as the material on other sections of the world in other parts of the textbook. The pictures of New Zealand do not really give an idea of what the country is like.

Yes, the purpose of this section was only to give the reader a general idea of these areas. This the author did.

You may have other reasons to support a yes or no answer. This is good.

7. The climate is nicer to live in. The landscape is not mountainous, which means that more of the land can be used for agriculture. More agriculture means that more people can be fed. The area, without mountains, would make it easier to build cities. You may have other reasons, fine.

8. Most of the population of New Zealand is English. The people settling the country brought their English customs with them. The country today has very close ties with England, and thus the English influence still remains strong.

9. There are two possible answers.

Yes is the best possible answer. The government has set aside national forests. The government controls the cutting of trees which prevents the trees from being wiped out and the top soil from being washed away by not having any plant cover over it.

Answer Sheet for Worksheet IV, Section 5

No, the government is not doing enough. More land should be put back into forests. You may have other reasons, fine.

10. Much of the land is desert or grassland and will not support many people. The country is so far away from Europe, its major supply of immigrants, that many go to nearer countries such as Canada. Also, today, large numbers of people are not emigrating as they did in past times.

11. Wellington.